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ABSTRACT

The Pittsburgh Plan, a voluntary hometown plan designed to place minorities in local building trade unions, is described in detail from the perspective of its operations, its effectiveness in carrying out its purpose, and the individuals it serves. A benefit-cost analysis of the Pittsburgh Plan is presented. The significance of the results and its shortcomings are discussed and parametric variations on all significant parameters are performed to test its sensitivity. On the macro or program level, descriptive analyses are presented and alternate program structures derived. Analyses of the historical costs involved in all phases of the Pittsburgh Plan are performed and reported from different perspectives. On the micro level, attention is focused on the individual being served by this program. Multivariate statistical tools are used in analyzing such characteristics as seen to govern or indicate individual success. Based upon the results of analyses on both the individual level and the program level, alternate program structures and program content are explored. In order to permit easier and more explicit investigation of the ramifications of alternate program policies, structures, and content, two simple linear programing models are developed and their range of applicability demonstrated. A "weighted sum of benefit-cost ratios" criterion is used as another means of selecting alternate program recruitment and selection policies. (Author/WL)

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A STUDY OF THE PITTSBURGH PLAN

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ABSTRACT

One of the first of its kind, the Pittsburgh Plan is a voluntary home-town plan designed to place minorities in local building trade unions. In this report, the Pittsburgh Plan is described in detail from the perspective of its operations, its effectiveness in carrying out its purpose and the individuals it serves.

An extensive benefit-cost analysis of the Pittsburgh Plan is presented. The significance of the result and its shortcomings are discussed and parametric variations on all significant parameters are performed to test its sensitivity.

On the macro or program level, descriptive analyses are presented and alternate program structures derived. Extensive analyses of the historical costs involved in all phases of the Pittsburgh Plan are performed and reported from different perspectives.

On the micro level, attention is focused on the individual being served by this program. Multivariate statistical tools are used in analysing such characteristics as seem to govern or indicate individual success. Due to data restrictions, these analyses are presented only for one of the two sub-populations identifiable in the Plan. Using the resulting "success profiles" recruitment and selection strategies are mapped. An alternate approach, via a simple Markov Chain model of the stay in union training programs, is discussed for both groups. The attempt here is mainly to analyse the actual termination rates for each group.

Based upon the results of analyses on both the individual level and the program level, alternate program structures and program content are explored. In order to permit easier and more explicit investigation of the ramifications of alternate program policies, structures or content, two simple linear programming models are developed and their range of applicability demonstrated. These models also allow for different objectives on the part of the policy makers. Finally, a "weighted sum of benefit-cost ratios" criterion is used as another means of selecting alternate program recruitment and selection policies.

SUMMARY

Although some of the most significant findings and recommendations are discussed here, others are reported in the summaries at the end of each chapter.

Program Origin and Purpose

The Pittsburgh Plan is a program which was originally formulated through negotiations at the local level. The impetus for these negotiations was the social unrest through demonstrations by the Black community and pressure from the Federal government. The "voluntary" agreement reached in October, 1970 by local groups representing the building trades unions, construction contractors and the Black community was to immediately begin placing a number of minorities into the trade unions' training programs with a goal of adding 1,250 minority journeymen to union membership by the end of 1974.

Program Results

As of December 31, 1975, one year after the initial target date, there had been 808 minority placements in union training which were validated by the Office of Federal Contract Compliance. Of these, only 94 individuals had received their journeyman's book. A total of 631 were either journeymen or still in training. The original goal of adding 1,250 minority journeymen within four years was clearly unattainable considering the 3 to 5 year training requirement of the union programs. The situation was exacerbated by the additional requirement of 1,000 hours of jobsite work per year, coupled with the severe downturn in the construction industry during this same period. With each passing year and its newly negotiated number of union training slots for minorities, it is increasingly clear that the parties to the original agreement no longer consider the goal of 1,250 journeymen to be relevant. One can only speculate, but justifiably so, whether the number of minority journeymen resulting from the Pittsburgh Plan might have been greater had more realistic and enforceable goals been set initially.

Program Types -- Pre-apprentice and "Direct"

Three separate training organizations have served persons, "pre-apprentice trainees", who need academic and vocational training to prepare them for placement in the building tade unions (and other jobs). In addition, these organizations' staffs have assisted persons who do not need this training, but desire trade union employment, the "direct placements". The direct placements (who

are, on the average, older with greater prior income and more job experience) have been significantly more successful in remaining in union training once placed. This higher retention rate, coupled with the fact that the cost of placing a person directly is much less than the cost of training and placing a pre-apprentice trainee ($1,780 versus $5,030), means that the cost per journeyman for the direct placements is approximately one-fourth of that for the pre-apprentice placements ($2,240 versus $8,570).

Choosing the Appropriate Program Type

Given that two trainee populations are identifiable (they have been found to have significantly different characteristics which can be identified through selection procedures) and the differences in program cost and trainee retention rate can be estimate, then the "best" program type (pre-apprentice or direct placement or a combination of the two) can be determined using some simple management models. The decision-maker need only provide the desired policy objectives and other details (such as the budget) to use these models effectively in program choice. For example, with an objective of placing the most persons at minimum cost, only the direct placement program is recommended. With an objective of maximizing the increase in earnings to job placements so that all negotiated union slots are filled (and with a budget constraint), it appears that a mix of the two program types would be best.

Selecting Trainees

In the selection of individuals for pre-apprentice training, all analyses indicate that the older, better prepared and more experienced individual should be chosen. Using a crude index of the above characteristics, the population of potential trainees can be categorized as either "under-employed" or "unemployed". A simple model was developed to assist the decision-maker in the proper selection from among the two types. The model demonstrates that the appropriate strategy is very heavily dependent upon the policy objective(s) and other program parameters (such as the budget and the number of union slots available).

Recommendations for Improving the Pittsburgh Plan Program Design

The nature of the negotiated agreements under which the Pittsburgh Plan has operated suggests several opportunities for improving the program design. These negotiations establish the number of union training slots which are available for minority placements each year. Once the negotiated number of

placements has been made, the unions' committments are fulfilled--there is no provision that guarantees that a certain minimum number of minorities will reamin in the union training programs. This has meant that when a minority trainee leaves, the negotiated slot is irretrievably lost.

These constraints demand that heavy emphasis be placed upon screening and selection, that those persons who will ultimately be entrusted with a union training slot be chosen very carefully and diligently. The potential benefit from such an increased emphasis on selection is a significant increase in the retention of placements in union training.

Implicit in the improved program design, with increased selection, is the fact that many persons will be contacted (and possibly trained) who will not be sent for union placement. In addition, there will be many who will not succeed in getting into a union training program. This points to the need for the active pursuit of other sources of employment opportunities. Granting trade union placement a high priority does not negate the possibility of assisting those persons not placed in their search for alternative employment. Such active cultivation of other employment sources should improve the overall "return" on program investments without a significant increase in total expenditures.

Another opportunity for program improvement is the creation of an effective information system for the follow-up of former trainees and direct contacts who have not been placed in jobs. The research has shown that the vast majority of those pre-apprentice trainees who leave classroom training without having been placed in a job are never subsequently placed by the Pittsburgh Plan staff. Thus far, explicit consideration has not been given to the trade-off between current training and follow-up. The shifting of some resources from current training to follow-up of former trainees should improve program performance. Follow-up is a problem which will face all future training programs for union entry since the dates for entry to the various union training programs will never conveniently coincide with the pre-union training program's schedule.

PREFACE

This is the final report on research sponsored by the Department of Labor under Contract No. 21-42-74-20. The Pittsburgh Plan was one of the first voluntary homstown plans in the nation and was begun to co-operatively solve the affirmative action problems of local building construction unions. The Pittsburgh Plan is both a precursor for similar affirmative action plans across the nation as well as an alternative solution to the imposed plans such as the Philadelphia Plan. As such, we hope that the research presented here will be of use in the formulation both of national as well as day-to-day management policies with a view to improving the affirmative action record of construction trade unions and reducing the overall costs of such programs.

Spread over nearly three years there have been many who worked directly or indirectly on this Study. At various time the following worked directly on the Study as members of the Research Team: Jeanne Bilanin, Ronald Boyce, George Burman, Otto Davis, James Guidry, Michael Horton, Norman Johnson, Suresh Konda, Carolyn Link, Judy Parker, Wayne Perry, Nate Smith, Edward Steger, Arnold Weber, Gary Wigmore, Charles Winkler and Tammar Zeheb.

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INTRODUCTION

The Study of the Pittsburgh Plan, based in the School of Urban and Public Affairs, has been an effort to develop improvements for the minority entry into the building trades unions. The execution of the study has involved major commitments to data collection, analysis, formulation of policy and management recommendations, and most importantly, developing working relationships with the many organizations involved. The result is a set of recommendations, presented for alternative program objectives, which should aid in improving decisionmaking for program managers and policy-makers.

The report opens with a lengthy descriptive section, Part I, which describes Pittsburgh's pre-apprentice training organizations and the union placement process as it operates in Western Pennsylvania. Extensive analyses are presented on factors related to individual participant success and failure in each stage of the process from initial contact with the Pittsburgh Plan to obtaining the journeyman's book. Also included is an economic evaluation of the program and various breakdowns of program cost.

The core of the report is Part II, a set of conclusions and recommendations for improved operation of programs such as the Pittsburgh Plan. Detailed recommendations are presented for the two primary program functions, union placement and pre-apprentice training.

Part III is a brief summary reporting on the technical assistance provided to the management of the Pittsburgh Plan.

The research effort required a great deal of interaction with the many, often conflicting, forces which shape the environment in which the Pittsburgh Plan functions. The needs and motivations of the various parties involved, the building trades unions, the construction contractors, the organizations and offices of the Pittsburgh Plan and other local agencies and interestes tend to obscure the needs of the program's clients, black males, mostly aged twenty to thirty-five, who seek a genuine opportunity to work in the building trades. This report attempts to keep the focus on the individual participant by viewing the pre-apprentice training organizations and the construction union environment from the trainee's perspective and by discussing at length the issue of critical interest to the trainee, ways to increase the changes for success in union employment.

CHAPTER 1

OVERVIEW OF PITTSBURGH PLAN

Prior to 1964, national policy regarding the problems of exclusionary or discriminatory employment practices against blacks in the construction industry had resulted in the creation of agencies or commissions with investigative powers relying upon persuasion and publicity to produce voluntary improvements in union racial practices. The passage of the 1964 Civil Rights Acts established the courts as a major means of redressing individual complaints by Title VII which made it an unlawful employment practice,

1) Section 703 (c)

> "for any union to exclude, segregate or cause or attempt to cause an employer to discriminate against any individual because of his race, color, religion, sex or national origin,"

and 2) Section 703 (d)

> "any union or joint labor-management committee controlling apprenticeship or other training to discriminate in these programs on the basis of the above five forbidden criteria."[1]

This is a slow process and it is extremely difficult to prove outright discrimination against individuals. As an example in January, 1964, the U.S. Department of Labor made effective a regulation[2] which provides for non-discrimination in apprenticeship programs. The regulation also permitted review of "objective" entry standards. This has encouraged the unions to greatly accelerate their use of formal written and oral tests for admittance to apprenticeship programs (as well as journeyman status in some cases). Thus, the unions have claimed that they do not discriminate but the blacks do not apply or cannot pass the "objective" entrance requirements. Some

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[1] Marshall, F. Ray, The Negro Worker, Random House, New York, 1967, p. 107

[2] 29 CFR 30

have argued that this practice merely gives them the means to perpetuate the status quo. Thus, the question has arisen whether equal treatment would provide equal opportunity, for blacks have lacked the educational and other occupational advantages enjoyed by whites.[1,2]

In September, 1965, President Johnson issued executive order 11246 which drastically changed these previously punitive methods of improving discriminatory employment practices by the use of the courts or through persuasion. This executive order changed the burden of proof from the aggrieved to the employer, on Federally funded contracts. Thus, the contractor must prove that he is not discriminating or that he is taking "affirmative action" to correct prior racial imbalances. The failure to comply with this order can result in cancellation, termination, or suspension of a contract or any part therein.

Since approximately 70 percent of heavy construction is financed either directly or indirectly by Federal monies, there was little doubt that this order would have a significant impact on the construction industry. The order led to the establishment of the Office of Federal Contract Compliance

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[1] A U.S. Supreme Court decision helps to clarify the interpretation of the 1964 act [see Griggs vs. Duke Power (401 U.S. 424 1971)]. The Griggs case before the court related to the requirement of a high school education or the passing of a standardized general intellegence test as a condition of employment or transfer to a job when -- 1) neither the education nor the test was shown to be "significantly" related to successful performance on the job; 2) both qualifications screened out blacks at a "substantially" higher rate than whites; 3) jobs which were fenced in by the standards had been filled only by whites as part of a past non-discriminatory policy. The court held that Title VII required the removal of "artificial, arbitrary, and unnecessary barriers to employment" when the barriers operate "so as to discriminate". Under the Act, practices, procedures, or tests neutral on their face and even neutral in terms of intent, cannot be maintained if they operate to "freeze" the status quo of prior discriminatory employment practices." See Gould, W. B., "Racial Discrimination the Courts and Construction," Industrial Relations, Vol. 11, No. 3, October, 1972.

[2] Rowan, Richard L., and Lester, Rubin, "Opening the Skilled Construction Trades to Blacks," Report No. 7, Industrial Research Unit, University of Pennsylvania, Philadelphia, Pa., 1972.

(OFCC) in the U.S. Department of Labor and to the possibility of a powerful weapon to force contractors to integrate the work force. Simply, when Federal money stops, their primary source of income stops. Thus, it was hypothesized that economic necessity would prevail, i.e., when the cost of the loss of income exceeds the benefits derived from racially discriminatory practices, most contractors will choose to minimize their losses.[1]

The most ambitious initial implementation of executive order 11246 was the establishment of the "Philadelphia Plan" in mid 1969 by the OFCC. It required that bidders on all construction projects receiving Federal assistance greater than $500,000 submit affirmative action plans setting specific "goals" or "quotas" for the utilization of minority employees based on Federally established standards. While promising to meet these percentage goals specified by the plan and written into Federal contracts, contractors were required to increase minority participation or demonstrate a "good faith" attempt to meet these quotas.[2] Subsequently, in mid 1970 a similar "imposed" hiring plan was begun in Washington, D.C., which was expanded to include employment on private construction projects as a part of the plan's goals. Thus, in 1969 a new period of government regulation in the construction industry was begun.[3] In early 1970 there was the threat that a Philadelphia-type plan could be put in effect in every major city across the country. Backed by the Nixon Administration, the Secretary of Labor in February, 1970, issued a recommendation to establish a national program to achieve equal employment opportunity in Federally funded construction work. Nineteen cities were selected and offered the alternative of developing a "voluntary" hometown plan or one following the guidelines of the

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[1] Dubinsky, I., "Trade Union Discrimination in the Pittsburgh Construction Industry," Urban Affairs Quarterly, Vol. 6, No. 3, March, 1971, pp. 297-318

[2] Ibid.

[3] Rowan, Richard L. and Lester, Rubin, "Opening the Skilled Construction Trades to Blacks," Report No. 7, Industrial Research Unit, University of Pennsylvania, Philadelphia, Pa., 1972.

imposed Philadelphia Plan. In January, 1970, with the signing of the "Memorandum of Understanding," Pittsburgh was one of the first major cities to formally initiate a voluntary hometown plan.[1] Thus, these two Pennsylvania cities were among the first in the country to be included in the current list of 100 or more imposed and voluntary affirmative action plans in the construction industry. The basic difference between the two approaches is that the voluntary Pittsburgh Plan was designed to place (by apprenticeship or on-the-job training) a number of minority individuals in each of the participating skilled crafts of the construction industry with the intent that those who were placed would become union journeymen and be assured of continued employment opportunities. In contrast, the Philadelphia Plan was established to assure that a stated percentage or "quota" of man-hours of employment would be provided to minority members under a given construction contract with no particular attention given to the individual placed and/or his employment opportunities beyond that contract. Thus, the Philadelphia Plan was directed primarily at contractors.

As a recent study[2] has recommended, it is clear that a certain amount of hometown administration is necessary for any affirmative action plan to work. The term "voluntary", however, applied to the Pittsburgh Plan is obviously a misnomer, since individual local union leaders would not go against the wishes of the majority of their constituency or the joint union-contractor heirarchy by attempting to actively recruit minority members into the unions. Similarly individual contractors, especially since many are not in a sound financial condition, would not, solely for the purpose of increased minority participation, do anything to endanger their relations with the unions. Thus, the voluntary plans must provide an adequate threat to force both unions and contractors into "volunteering" and to force them to continue

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[1] Dubinsky, Irwin, Reform in Trade Union Discrimination in the Construction Industry, Operation Dig and Its Legacy, Prager, New York, 1973.

[2] Dubinsky, I., "Trade Union Discrimination in the Pittsburgh Construction Industry," Urban Affairs Quarterly, Vol. 6, No. 3, March, 1971, pp.297-318

to "volunteer".[1] If any of the participants choose not to continue participating, "volunteerism" is dead. Consequently, "volunteerism" cannot be imposed. It must continue to be sold to the various participants as the most viable alternative. Perhaps its two greatest selling points are; (1) it allows the contractors and unions the flexibility to adapt to local market conditions, (2) its aim is to guarantee to the minority community significant numbers of book-carrying union journeymen in the skilled crafts. Possibly the single most significant contribution of the voluntary agreements is the establishment of on-the-job training as an alternative to the formal apprenticeship route for entry into the unions.

Although use or threatened use of the imposed plans (as well as the array of other anti-discriminatory policies)may have done much to increase the demand for minority skilled workers it appears to have done relatively little to increase the supply of these workers. An imposed plan is not a surrogate for cooperation between those who need minority workers and those who know how and where to find minority applicants. There have been cases where openings were created but the slots go unfilled because of: 1) the reluctance of contractors to seek minority applicants; and/or 2) the lack of understanding of the industry by minority organizations. Thus, although government and/or minority group pressures may create an incentive to employ more minorities, the recruiting, training, placement and follow-up activities which will ultimately determine the success of either type affirmative action plan must be coordinated and locally administered. The fragmentation of the imposed plans appeared to increase tensions and frustrations in both the minority communities and the construction industry.[2]

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[1] Dubinsky, I., "Trade Union Discrimination in the Pittsburgh Construction Industry," Urban Affairs Quarterly, Vol. 6, No. 3, March, 1971, pp. 297-318

[2] Dubinsky, I., "Trade Union Discrimination in the Pittsburgh Construction Industry," Urban Affairs Quarterly, Vol. 6, No. 3, March, 1971, pp. 297-318

This local voluntary approach to compliance for minority placement, as previously stated, was first implemented in the Pittsburgh area in January, 1970, and the "Pittsburgh Plan" was one of the first plans to receive funding from the U.S. Department of Labor for the entire year of 1973.[1] The initial target of the Pittsburgh Plan was to increase minority employment in the construction industry by placing 1250 individuals in the craft unions. This represents a voluntary agreement among the Pittsburgh Building Trade Unions, the Construction Contractors Associations, and the minority groups represented by the Black Construction Coalition. The latter coalition consisted of a broadbase of established local black leaders and educators. The program is governed by a representative 12 member administrative committee comprised of four representatives of the trade union council, four construction contractors, and four persons appointed by the Black Construction Coalition. One of the representatives appointed by both the Contractors Association and the trade union council must be black. The three groups represented on the committee mutually agreed on a thirteenth member to serve as chairman without vote. The Administrative Committee was incorporated as a non-profit group entitled the Pittsburgh Building Construction Industry Administrative Committee for Research, Education, Training, Inc., since funding and contracts were needed for the training portion of the plan.[2]

As of December 31, 1975, 808 minorities were placed in the unions' regular apprenticeship programs or in special on-the-job training programs. It is clear that the initial goal of placing 1250 minority individuals in four years was overly optimistic.

The following description of the Pittsburgh Plan is a brief introduction to the various activities of the Plan and will be taken up in detail in

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[1] The DOL funded the Plan (directly or indirectly) through 1974. In 1975, Allegheny County took over the funding and, as of this date, the future funding of the Plan is in doubt.

[2] Dubinsky, Irwin, "Trade Union Discrimination: An Analysis of the Problem," Unpublished Masters Thesis, Graduate School of International and Public Affairs, University of Pittsburgh, Pittsburgh, 1970.

succeeding sections. To assist in keeping the various aspects of the Plan in perspective, Figure 1 is a flow diagram of a typical Pittsburgh Plan participant. While simplified, with reasonable accuracy it captures all the essential elements.

1. Recruitment, Selection, Training

a) Pre-Apprenticeship

This is a program to prepare minority adults from 18 to 26 years of age to pass the joint-labor-management apprenticeship test and/or G.E.D. high school equivalency certification if necessary. The program lasts for a maximum of 25 weeks and is conducted by three established black training organizations: Operation Dig (DIG), Bidwell Cultural and Training Center (Bidwell), Opportunities Industrialization Center (O.I.C.). Each is located in a different geographical region of Pittsburgh and each has its own recruiting, screening, and pre-apprenticeship program.

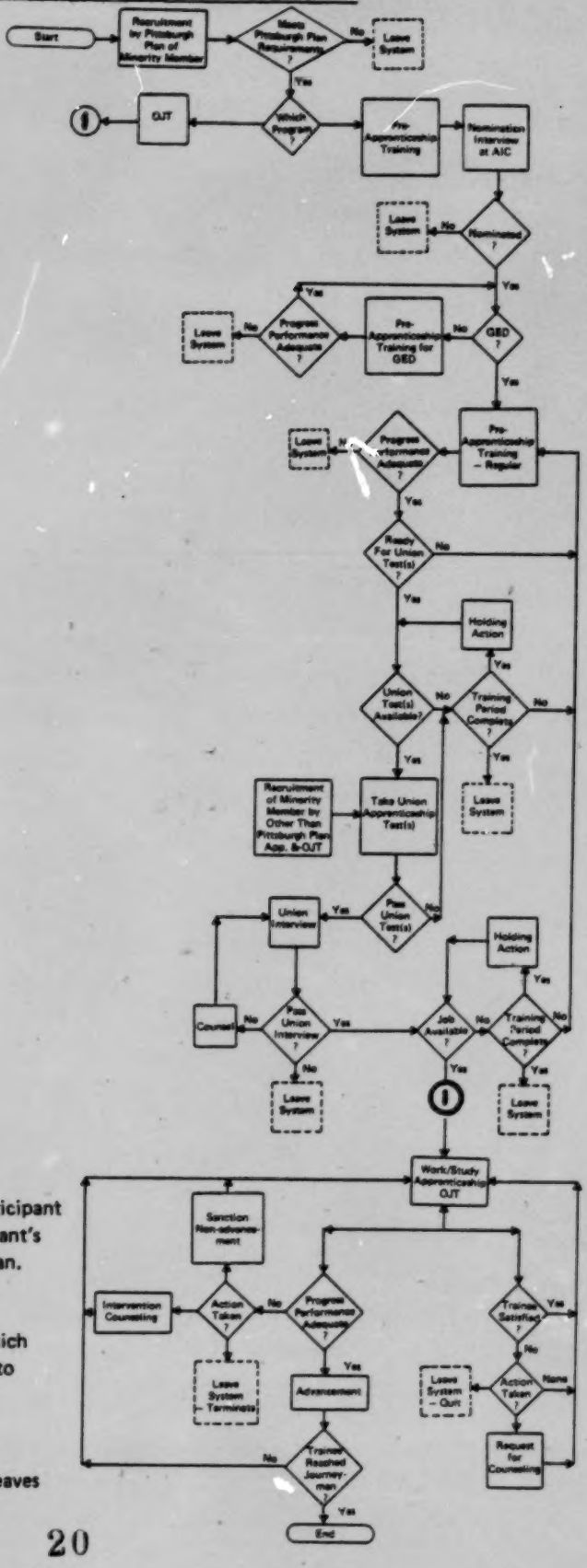
b) Union Placement

This segment of the Plan is designed to act as the primary channel of communication between the Black community and the unions. Whenever information is received about union openings (both Apprentice or OJT) individuals are notified. These individuals may be any of three types: PAP trainees (either current or terminated); individuals recruited by the Plan but either not qualified for or not interested in the PAP; and, individuals who walk in and express a desire to enter the construction industry. Those expressing a desire to try for the union in question are screened (marginally) and the appropriate paper work done. They are also helped in preparing for the union screening process via some refresher courses and in some cases, "mock-interview" training.

2. Coordination

The coordination unit is responsible for: 1) all financial coordina-

Figure 1 Pittsburgh Plan Participant Flow Model



An activity made by the participant or one which affects participant's involvement in Pittsburgh Plan.

A decision or a condition which must be met for participant to proceed in sequential flow.

Indicates that a participant leaves the Pittsburgh Plan system.

tion with subcontractors, 2) implementation of all processing procedures for various training programs, 3) reporting to all state and federal agencies in the overall program, and 4) master scheduling of all trainee tests. Community Action Pittsburgh (CAP) is charged with these responsibilities under the guidance of the Administrative Committee.

3. Follow-Up

a) Follow-Up Counselors

Assistance is rendered by each of the training organizations (Bidwell, OIC, DIG) to their candidates in any phase of the Pittsburgh Plan during training and for a period of one year after completion of training.[1] This is performed through personal visits, record keeping and evaluation procedures. The personnel responsible for this service are called follow-up counselors and each is assigned a case load with regularly scheduled visits.

b) Field Supervisors (separate component associated with the plan)

These persons serve as a separate supportive element to the Pittsburgh Plan having the responsibilities of: 1) minimizing turnover once the minority applicant has taken the apprenticeship test and after job placement, 2) maintaining harmony between the minority trainee and his working and school environment, 3) coordinating with follow-up counselors and 4) communicating detailed descriptions of any crisis and/or problems in the form of weekly and monthly reports to the president of the Administrative Committee.

The complex interaction of the various organizations and bodies involved in the Plan is difficult to illustrate. Figure 2 in a sparse fashion is an illustration of the Plan's structure and does not attempt to capture this complexity.

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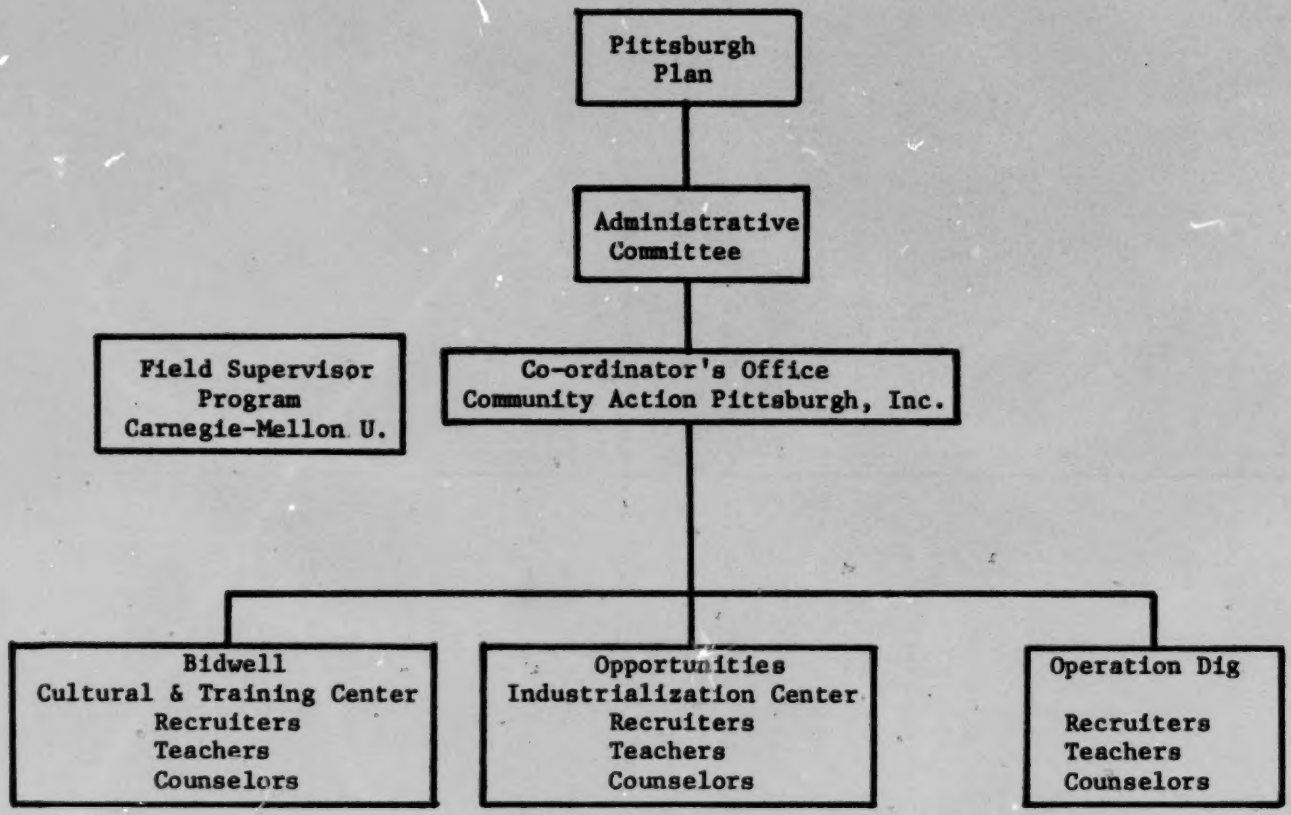
[1] For all intents and purposes, counseling services are provided only to those currently enrolled in the PAP and those placed in a union training program.

Figure 2 Structure of the Pittsburgh Plan


Pittsburgh Plan
Administrative Committee
Field Supervisor Program Carnegie-Mellon U.
Co-ordinator's Office Community Action Pittsburgh, Inc.
Bidwell Cultural & Training Center Recruiters Teachers Counselors
Opportunities Industrialization Center Recruiters Teachers Counselors
Operation Dig Recruiters Teachers Counselors

CHAPTER 2

PRE-APPRENTICE PROGRAM AND THE TRAINING ORGANIZATIONS

The three training organizations, Bidwell Cultural and Training Center (Bidwell), Operation Dig (DIG), and Opportunities Industrialization Center (OIC) have all been funded to train persons needing remedial, academic and vocational training to prepare them for acceptance and placement in the building trades, thus being "pre-apprentice" in nature. More specifically, their common goal is to overcome individual trainee deficiencies so that the trainees can at least meet the minimum requirements of application to the building trade unions and, more optimistically, be able to compete with other applicants as desirable apprentice candidates. This constitutes the pre-apprentice route to union training placement.

In addition, all three organizations perform the screening and placement assistance functions for persons who, having been interviewed by recruiters or other staff (or in a few cases only writing to or calling the organization), are deemed to meet the requirements for union placement without the formal pre-apprentice training. This constitutes the direct route to union training placement.

DESCRIPTION

Organizational Context

The three organizations are staffed very similarly although the larger organizational context in which they function is quite different. A brief discussion of these institutional differences is provided to give perspective to the description of staff activities.

Bidwell Cultural and Training Center is a neighborhood training center, well known within the community it serves, the North Side of the City of Pittsburgh. Bidwell houses in one building an array of major training programs; currently there are three programs other than the Pittsburgh Plan.

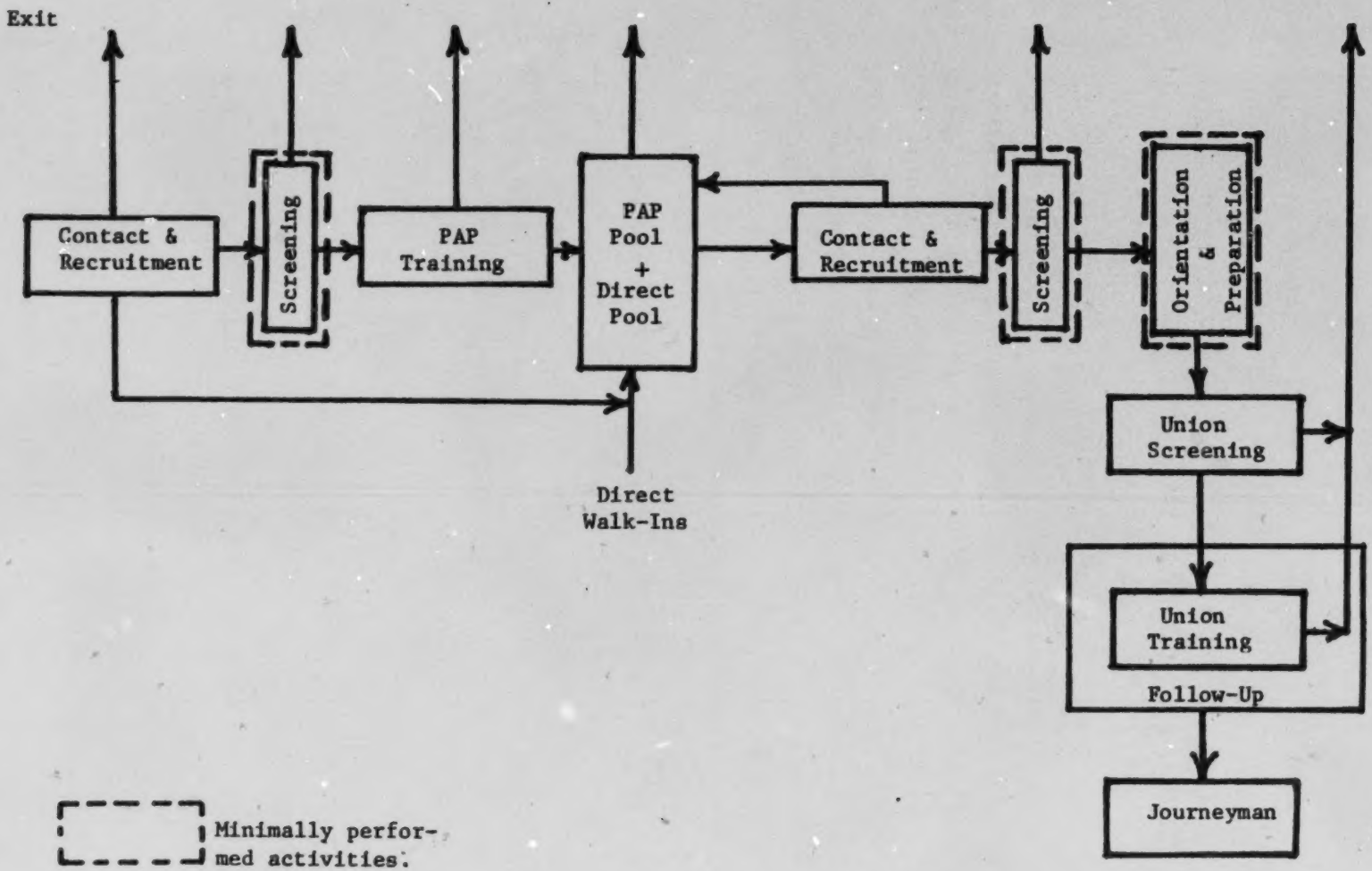


Figure 3 Mass Flow Diagram of the Pittsburgh Plan

The overall organizational structure is vertical, i.e., each program operates somewhat independently with little sharing of personnel, in effect being several separate programs under a central policy element.

Opportunities Industrialization Center also offers a number of other programs besides the Pittsburgh Plan at any given time. The organizational structure at OIC, however, is horizontal with functional units (recruiting, training, etc.) serving trainees in a number of programs. Housed in two buildings in Pittsburgh's Hill District, OIC is probably the most widely known of the three organizations.

Operation Dig is somewhat different in that it operates solely to provide the services of the Pittsburgh Plan. Since the Plan is oriented primarily toward jobs in the building trades, Dig appeals to a more narrowly defined population and is not as well known. Dig is housed in one building in Pittsburgh's East Side.

Staff and Staff Roles Related to Organizational Activities

Figure 3 is provided as a reference for the discussion of staff roles. The figure is a schematic representation of the various processes involved in providing the services of the training organizations to minority individuals. Pittsburgh Plan staff members are active in every stage of the flow except for union screening and selection (where applicable) which is handled by the unions themselves.[1]

As identified by job title, the staffing of the organizations for budget year 1975 is shown in Table 1.

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[1] One union does actually employ Plan staff to select from among the minority applicants.

TABLE 1 Training Organization Staffing - 1975 Budget Year*

Job Title	Bidwell	Dig	OIC
Coordinator	1	1	1
Recruiter/Follow-up Counselor	3	3	2
In-house Counselor	2	1	1
Teacher	2	2	2
Custodial/Clerical	3	3	3
Financial	2	-	2
Executive	1	-	2

*Some custodial, financial, and executive staff salaries are only partially funded by the Pittsburgh Plan budget.

The staff pursues the complete set of activities of each organization in relation to the Pittsburgh Plan, training and placing pre-apprentice trainees in union and other jobs and placing other individuals directly in unions. The task of deciding how much effort is devoted to each of the functional activities (recruiting, counseling, etc.) is by no means straightforward. Interviews at all three organizations confirmed that many staff members perform other functions than those indicated by their job titles. This situation also frustrates efforts to provide simple estimates of the division of effort between PAP and direct placements. Combining the information gathered from several sources, staff interviews, extensive analysis of the 1971-1975 budgets and analysis of participant flow (as in Figure 1), a matrix of job title by time devoted to each functional role was developed. (See Chapter 7 and Appendix D for more details and results.)

Of these functions, selection for PAP, in-house counseling and training are devoted exclusively to pre-apprentice trainees. Follow-up is performed

for all placements both PAP and direct. Recruiting and placement assistance is performed for all persons served by the Plan. Operational definitions of these program functions are provided in the following description of program operation.

General Program Operation

While each organization has staff with similar job titles and functional assignments, the operation of each organization in terms of the flow or processing of pre-apprentice and direct placements (see Figure 1) is somewhat unique to each organization. These programmatic similarities and differences are discussed below.

Recruitment

The three organizations recruit along fairly similar lines. Personnel are directed to use every available means of contact; formal and informal meetings at educational institutions, maintaining contact with friends and family of persons already placed, meeting people on the street, communicating the availability of training and placement assistance and developing interest in the building trades as a source of employment. Bidwell, Dig and OIC all maintain formal records of contacts, "Recruiter Fact Sheets." A number of such recorded contacts is established as a monthly goal for each organization.

While recruiting, no distinction is made between potential PAP trainees and direct placements. Recruitment for pre-apprentice training classes is an on-going process with a surplus of interested candidates maintained on a waiting list. Recruitment for direct placements is also a function which is performed continuously, however the number of persons required to be recruited for a specific trade is not known until the unions announce the number of trainee slots available, at most a few months in advance of acceptance. Occasionally a special effort is required due to a significant number of openings available in a specific union for which there are not enough recruitment contacts who have expressed interest. In contrast, recruitment for the pre-apprentice program is not related to interest in a particular union as the training provided is generally not oriented toward a particular trade.

Of special interest are recruiting guidelines, the formal and informal directives to recruiters as to the type of person that they are encouraged to contact for the pre-apprentice program and for direct placement. These guidelines have received great attention from the Research Team as this research seeks to independently develop statistically-based guidelines for recruiting. The guidelines common to all organizations are those which match the stated requirements of the unions; age (for apprentice programs), acceptable health and an interest in the trades. More unique guidelines are noted below.

BIDWELL	PAP	None
	Direct	GED Experience in the crafts[1]
DIG	PAP	
	("Type A", full 6 month PAP, enrolls and gets stipend)	GED
	("Type B", less formal, no stipend, no requirement to fulfill)	None
	Direct	Prefer GED
OIC	PAP	Prefer high school graduates
	Direct	Prefer GED

[1] Marginal requirement.

The stated recruitment guidelines are quite loose with education, age and interest in the construction industry the only real criteria. Interviews have yielded greater insight by revealing the preferences of the organizations' managers as to the perceived mission of the organization and the appropriate persons to be served. Bidwell seeks to help those with the least opportunity of finding employment in the absence of the Plan. Dig is constrained by the fact that it does not have the capability of training persons to receive a GED and is oriented toward assisting anyone who wants their help. Dig seems to have the least defined philosophy regarding the type of person that is a desirable recruit.

OIC shows concern for finding the "right" type of person, the person who will "stick it out" in the union once placed, the person with considerable interest in and desire for building trade employment. This suggests more selective recruiting. Recruitment at OIC, however, is handled by a recruitment section which recruits for all OIC programs and it is not known to what degree the management's preferences actually shape the recruitment process.

Selection for Pre-Apprentice Program

From all applicants each organization must decide which individuals to accept into the PAP. Classroom instruction has usually been a continuous process with persons entering and exiting at any time during the year. A waiting list of potential trainees is maintained so that vacancies in the enrollment can be filled immediately. Dig has tried scheduling a particular time period for its regular six months' training and recruited a full class for this formal training session. The relative success of this approach is not known.

Interviews have disclosed that Bidwell effectively performs no PAP selection whatsoever and so is excluded from comparative discussion of this function. The PAP entry process at Bidwell consists of a queue in which persons meeting the recruitment requirements are placed depending on their chronological order of contact. In a sense, then, the selection process at Bidwell is exclusively a self-selection process with those individuals remaining in the queue long enough eventually entering the PAP.

Bidwell's coordinator has stated that persons have waited as long as one year to enter the PAP.

The other two organizations utilize the information gathered through recruitment as well as personal interviews and standard aptitude testing. The process is as shown below:

The selection emphasis is generally as follows:

1. Dig
   a. Education - GED required for regular PAP entrants, preferred for those in the informal program.
   b. Work history - more skilled background such as factory employment is preferred.
   c. Lack of personal problems (drugs, criminal record, etc.).
   d. Driver's license holders preferred.
   e. Access to automobile preferred.
   f. Subjective estimation of motivation.
2. OIC
   a. Coordinator conducts the interview; operationally, the outcome of this interview <u>is</u> the selection process.
   b. Provide a union job orientation; understanding of problems to be encountered in working conditions, travel, etc.

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[1] At both Dig and OIC testing is used only as an indicator of potential not as a pass/fail criterion. A standard test of mental aptitude, mathematics and reading is used. Further, applicants at Dig are required to state a preference for two unions at the time of application.

[2] The interview at OIC does potentially serve as a pass/fail criterion. Dig's applicants are less likely to experience rejection at this stage.

c. Sincerity of purpose in PAP application.

d. Commitment to time required for union training (3 to 5 years).

e. Must produce documents (GED if obtained, birth certificate, etc.).

Summarizing, Bidwell performs no active PAP selection; Dig selects only to the extent of verifying that individuals meet the minimum requirements for union application while attempting to accommodate both those with and without GED's; OIC actually performs selection based primarily on the interviewer's perception of the applicant's motivation. It should be noted, however, that a prime consideration of the organizations is to maintain the full class size and selection can occur only when an excess of applicants is available to enter the PAP. Selection can also be limited by a lack of commitment to reject some applicants. While Dig and OIC do not place every applicant in a queue as does Bidwell, they both avoid the selection decision by placing many people on waiting lists also. Their selection might be better characterized as a screening process (which Bidwell lacks).

In-house Counseling

All three organizations employ individuals whose primary task is counseling pre-apprentice trainees. This counseling concerns vocational interests and aptitudes, educational and training goals and personal and family problems. Counseling is an ongoing process with private sessions usually scheduled with each individual once per week. There appear to be no significant differences in the counseling process between the three organizations.

At Bidwell the counselors also maintain records of former trainees and contact them when union openings occur (part of the placement assistance process). At Dig the counselor participates in the interview/selection of PAP trainees.

At Dig and OIC the counselors also provide evaluative reports on each trainee, as do the instructors.

Training/Teaching

The training at the three organizations is provided to PAP trainees for a six-month period during which stipends are provided. The type of

training available varies considerably between the three organizations; Bidwell is the only organization providing vocational training in the crafts; Dig is the only one that does not have a GED capability. At all three locations the greatest emphasis among the academic subjects is placed on mathematics.

In Bidwell, PAP trainees are routed as follows: (1) those without a GED are sent immediately into GED courses; (2) those with a GED have a choice of vocational training in the construction crafts or college preparatory courses; (3) a rare individual participates in both vocational and college preparatory training. The academic curriculum at Bidwell includes English and mathematics.

Operation Dig does not offer GED courses or vocational training. The emphasis in the training is on specific topics expected to be stressed in each union's placement test. The training is individually geared (to a very remedial level if necessary) to prepare the trainee to pass the union test. Trainee statements of union preference are used by Dig teachers to decide which subjects should receive the greatest attention. The curriculum includes reading, logic, science and mathematics.

While all three organizations keep records of attendance and tardiness and attempt to develop attitudes deemed appropriate for maintaining employment, Dig places the greatest emphasis on this "work habits" orientation including requiring trainees to punch a clock to develop habits of punctuality.

Pre-apprentice training at OIC is structured somewhat between the program extremes of Bidwell and Dig. OIC offers either GED or other academic courses to its trainees.

The Placement Assistance Process

Another major process to which all three training organizations devote considerable resources is the actual placement of individuals in the trade unions. (Although a number of persons are placed in other jobs, the effort expended toward these placements by Plan staff is minimal.)

Potential placements are drawn from the following sources: (1) PAP trainees currently in-house; (2) former PAP trainees for whom correct mailing addresses have been maintained; (3) individuals contacted but not

processed through the pre-apprentice program; i.e., the direct placements. Having identified potential placements the procedure logically falls into two stages, selecting those individuals who are to receive assistance for each specific union and following through with the placement assistance activities.

Selection for Placement

Ostensibly, not every trainee will be "right" for application to every union. Some selectivity is required to be fairly sure that a proper match of individual and job is effected. This selectivity may be exercised by the potential placement or by the training organization staff, or both. At present, it appears that these decisions are either made by the individual trainee or not made at all (the individual may also apply to any number of unions).

Bidwell relays to its trainees and direct contacts the announcement of availability of union slots. Then all persons who respond are sent to apply for placement. The same procedure is generally followed at Dig and OIC. Dig attempts to select to the extent that individuals who seem to desire placement in a union temporarily until a more satisfactory union slot opens are discouraged from applying.

Placement Procedures

Given that minimal effort is applied to selection of placement candidates for specific unions, the same placement assistance activities are available to each potential PAP placement within each organization.

Interviews indicate that a ranking of the organizations according to the emphasis placed on placement would show that Bidwell puts the least effort into actual placement activities while Dig emphasizes placement to the greatest extent.

Placement assistance at Bidwell consists essentially of communication of available union slots and provision of transportation if necessary to union placement functions (application, testing, interviews, etc.).

Considerably more attention is paid to placement activities at OIC as tutoring for specific union tests is provided to both PAP and direct place-

ments. OIC's coordinator states that a large percentage of those contacted concerning union slots utilize this tutoring service. A discussion is also presented as to points most likely to arise in union interviews if such knowledge is available.

Placement preparation is most advanced and sophisticated in the Pittsburgh Plan at Operation Dig. Tutoring is geared to specific union tests for both PAP and direct placements (as is the Dig curriculum). Dig handles the paperwork for the applicants and provides transportation to placement functions. In addition, for those persons passing the union tests, interview preparation is provided through the use of "mock interviews" at which the director (coordinator), teachers and counselor are present.

ORGANIZATIONAL ANALYSIS - CONTRIBUTIONS TO SUCCESS

One of the objectives of this study is to differentiate between the characteristics of the three training organizations in order to clarify which of the organizational factors contribute to success in union placement and training. The Research Team gathered information both on the organizations' success and on the organizations themselves. Where significant differences in the success of each organization's trainees and placements exist, differences in the organizations are a plausible explanation. Statistics of organizational activity and success are presented and then related to the earlier discussion of the operation of the three organizations.

Statistical Summary of Organizational Activity

One way of assessing the level of effort and results of each preapprentice training organization is to quantitatively compare the recorded events in each year of each organization's history. This is done in Table 2 both for actions of organization personnel (recruitment, completions, etc.) and for measures of participant success or operational results (nominated, enrolled, placed, etc.). Definitions of these activities are on the page following Table 2.

Table 2 is included solely to provide an indication of the volume of activity at each organization. These figures indicate that Pittsburgh Plan

TABLE 2 Statistical Summary of Activities Broken Down by Training Organization[a]

Activity[b]	1971			1972			1973			1974			1975		
	BID	DIG	OIC	BID	DIG	OIC	BID	DIG	OIC	BID	DIG	OIC	BID	DIG	OIC
follow-up	*	*	*	*	*	*	136	183	164	181	275	217	209	349	260
new recruits	386	674	599	249	371	330	293	484	344	263	534	382	338	519	419
enrolled[c]	158	189	203	90	85	77	89	102	93	92	101	92	115	97	95
terminations	69	58	103	43	34	25	24	22	31	13	24	31	25	18	19
completions	89	131	100	47	51	52	46	56	39	45	53	29	58	43	52
entered APP[d,e]	38	54	48	23	30	26	14	19	17	11	48	28	12	47	25
entered OJT[d,e]	37	36	36	28	31	33	23	40	28	32	54	35	19	38	23
entered other jobs	22	54	41	10	19	14	11	10	11	17	11	9	11	10	12

[a] Based on records from Pittsburgh Plan Monthly Progress Report, Office of the Coordinator.

[b] Definitions of activities are on the following page.

[c] This figure is inflated because of double counting.

[d] Includes placements not validated by OFCC as total placed in APP plus OJT in this table is 933 whereas the total validated placements for 1971-1975 is 808.

[e] See pp.37-42 for a discussion of the distinction between APP and OJT union placements.

* Not instituted or recorded.

Definitions of Pittsburgh Plan Recorded Activities (as displayed in Table 2)

follow-up	contact with placement in union to determine employment status
new recruits	indicates a minority person is contacted by recruiter and fills out a "Fact Sheet" which then is filed by the training organization
terminations	quit or dropped from pre-apprentice program
completions	successfully completed pre-apprentice program
entered APP	entered union training as apprentice
entered OJT	entered union training as OJT
entered other jobs	entered any job other than union construction

activities have been roughly equal at the three training organizations. Since 1972, when the Plan's budget was reduced significantly, the level of activity has been fairly constant.

The success of the three organizations (although only for persons placed in the trade unions) has been recorded in that the status of each person placed (in union training, terminated from union training, Journeyman) is recorded and updated in records of the Coordinator's Office. These records indicate the placement's organizational affiliation and allow an analysis of the organizations' differential rates of success at each level (completed PAP, placed in unions, made journeyman). Discussion of these results, as displayed in Table 3, follows a description of statistical tests of the significance of different trainee characteristics at the three training sites.

The observed differences in historical success between the organizations may be explained by many factors. One category of such factors might be the characteristics of the trainee populations at each location. It is conceivable that one organization might recruit and enroll (or attempt to place directly) trainees who are significantly different from those served at another location in terms of those personal characteristics closely related to "success". It should be noted that these personal attributes may include both those that have been recorded and analyzed in the success profiles (see Chapter 4) as well as other personal factors which may be even more relevant to determining success. Such trainee attribute differences are highly likely since the organizations serve geographically distinct and exclusive areas of Pittsburgh. Although recruiting areas overlap the preponderance of trainees for each organization are recruited from the general geographical area in which the organizations are located.

TABLE 3. Participant Success by Affiliation with Training Organization[a]

Success level (possible alternative definitions of trainee "success")	organization	number of successes	% of potential successes (all)[b]	% of potential successes (those who completed training)[c]
completed PAP	BID	285	62.1	N.A.
	DIG	334	68.2	N.A.
	OIC	272	56.5	N.A.
PAP placements in union training	BID	48	9.4	15
	DIG	119	24.9	36
	OIC	87	18.5	33
PAP placements in other jobs	BID	72	17.3	30
	DIG	105	28.5	49
	OIC	88	22.4	48
direct placements in union training	BID	159	N.A.	N.A.
	DIG	224	N.A.	N.A.
	OIC	171	N.A.	N.A.
union placements expected to stay in for full five years or more[d]	BID	159	76.8	35*
	DIG	212	61.8	38*
	OIC	160	62.0	36*
PAP trainees who were not placed	BID	170	60	N.A.
	DIG	107	32	N.A.
	OIC	95	35	N.A.

[a] From records of the Coordinator's Office, Pittsburgh Plan.

[b] "All potential successes" includes all those enrolled in PAP.

[c] Includes only those who have been successes in completing PAP.

[d] This serves as a surrogate for predicting the number of persons who will become journeymen (see Chapter 5).

* Here the potential successes include all who were placed, both PAP and direct placements.

In order to test the hypothesis that the trainee populations at each organization are identical, a K-sample test[1] was performed using all the variables in the DOL MA-101-MA-102 data.[2] This test clearly rejected the hypothesis that the three trainee sub-populations had similar characteristics and leaves open to further speculation the possibility that these trainee attribute differences are partially responsible for the difference in success rates observed. The following table gives the means and standard deviations for selected variables for each organization.

Table 4 Statistics on Selected Variables Brokendown by Training Organization

	BID	DIG	OIC
AGE	23.98 (3.227)	29.01 (2.807)	23.42 (3.119)
MIL	.202 (N.A.)	.241 (N.A.)	.255 (N.A.)
MAR2	.069 (N.A.)	.040 (N.A.)	.027 (N.A.)
PWAG	.424 (N.A.)	.473 (N.A.)	.608 (N.A.)
HEAD	.390 (N.A.)	.421 (N.A.)	.473 (N.A.)
DEPS	.510 (1.019)	.646 (1.113)	.6432 (1.174)
GRADE	11.5 (1.04)	11.75 (.299)	11.66 (.8658)
LCONUN	.066 (N.A.)	.069 (N.A.)	.0675 (N.A.)
LCONSK	.024 (N.A.)	.042 (N.A.)	.028 (N.A.)
LGENUN	.571 (N.A.)	.537 (N.A.)	.618 (N.A.)
LGENSK	.097 (N.A.)	.093 (N.A.)	.0787 (N.A.)
GAIN	2.093 (.8527)	1.905 (.7437)	1.918 (.747)
LINC	1 606 (1814)	1 966 (1862)	1 856 (1 836)
ABSPER	10.67 (11.61)	5.88 (8.17)	11.22 (14.36)

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[1] Tatsuoka, Maurice M., Multivariate Analysis: Techniques for Educational and Psychological Research, Wiley & Sons, New York, 1971, pp. 84-93

[2] See Appendix A for a description of this data.

Further tests to differentiate between the three organizations in terms of individual success rates indicate no basis for assuming any major differences in the training processes within the organizations. (See Chapter pp. 63-66 and pp.72-75 .) Roughly, this implies that the same individual would have about the same probability of succeeding in any organization. Again, this leaves open the possibility that the differences in the populations served at the three locations account for a considerable portion of the observed difference in success, although it does not indicate that such is necessarily the case. This analysis does suggest that the differences in the processes occurring at the three organizations is not a fertile area for isolation of factors relating to trainee success.

Although it cannot be confirmed that the attributes of the organizations themselves contribute differently to trainee success, an exploratory discussion of the organizational processes and observed success follows for each level of trainee success.

The results indicated in Table 3 are now considered in detail. The most obvious conclusion to be drawn from Table 3 is that at all levels of s success except termination rate from union training, Operation Dig seems to get the better result. This holds true for both numbers of successful partic participants and success as a percentage of total participants. There seem to be four explanations for this situation: (1) Operation Dig's continued existence depends exclusively at this time on the continuation of the Plan (being its only program); (2) Dig does not have a GED capability and therefore attracts PAP trainees who perhaps have better educational (and other associated) preparation(and possibly other associated skills gained through experience); (3) Dig's curriculum is designed to provide the preparation which is appropriate for good performance in union testing and interviews; (4) Dig appears to maintain closer ties with the unions. The last is a local factor and cannot be generalized to manpower programs elsewhere but which should not be overlooked in evaluating the success of the three organizations.

Considering the success rate at the level of PAP completion, the critical functions would seem to be recruitment and selection. Table 2

indicates that Dig consistently recruits a larger number of persons than the other organizations. (It is not known how much of this difference may be due to reporting differences.) To the extent that Dig's selection process can differentiate between applicants, this larger pool of recruits could contribute to a "better" population of PAP trainees. It should be noted that the statistics of PAP completion are somewhat deceptive. Dig does not attempt to provide GED training and therefore its trainees do not have an opportunity to "fail" in the GED process. Interviews seem to indicate that OIC has the more rigorous GED program which may account for its lower "success" rate.

Comparison of union placements is a more meaningful level for analysis. At this level the preparation provided by the various programs should be evidenced. Assuming the organizations' curricula do indeed account for differences in placement success, it appears that Dig's committment to a narrowly defined program (based on detailed knowledge of the union entry process) is a relatively successful strategy. Dig also demonstrates a clear superiority in placing persons directly (i.e., without PAP). This might also be related to the union-specific preparatory techniques employed by Dig as these services are also offered to potential direct placements. There is no other apparent explanation of organizational differences to account for the different number of direct placements. A significant result is that Bidwell, the only organization offering vocational training in crafts, has by far the lowest rate of PAP placement in union training. It may be inferred (disregarding trainee characteristics differences) that this training did not provide significantly useful preparation for success at the union entry stage. The low number of PAP placements by Bidwell (both union and other jobs) makes their cost per PAP placement considerably higher than that for Dig or OIC.

Success in remaining in union training (and reaching the goal of the union book) is related to many factors including the particular union and set of contractors with which the trainee interacts and the level of unemployment in the construction industry. It can be assumed, however, (with the large number of placements) that these factors do not bias organizational comparisons as each organization's placements are probably distributed

somewhat equally across the set of available unions and contractors and experiencing the same labor market conditions. The observed differences in union training termination rates may then reflect the usefulness of the training provided in the PAP programs and the appropriateness of the process which selects PAP trainees. After placement, the individuals from Bidwell have experienced the highest degree of success. A factor believed to be a large contributor to this relative success is the fact that of the three organizations Bidwell has the highest proportion of direct placements.[1]

It appears, however, that Bidwell's PAP trainees were also relatively more successful. Compare the union placement success of Bidwell and OIC as indicated in Table 3. Bidwell had slightly less direct placements than did OIC and only slightly more than half as many PAP placements as OIC. Yet the numbers expected to stay in union training for five years or more is essentially equal for the two organizations. Assuming both sets of direct placements have experienced approximately the same rate of termination,[2] Bidwell's PAP trainees have been more successful than those of OIC (as indicated by the near equal number of expected journeymen from fewer placements). This could be explained in part by the fact that Bidwell's PAP trainees must be more "motivated" in order to wait in the queueing entry selection process employed at Bidwell and therefore less likely to leave union training once the goal of placement has been achieved.[3] Another possible explanation is that vocational training[4] (which may not assist greatly in the union entry process) may indeed perform a valuable service by; (1) providing training useful on the job and/or, (2) providing an orientation to the particular crafts, thereby lowering the probability of termination due to mismatches between trainee expectations and actual job situations.

[1,2] Direct placements have a significantly lower termination rate. (See Chapter 5.)

[3] See Chapter 2 for details.

[4] Bidwell is the only organization which offers actual crafts training. See Chapter 2.

Other factors possibly related to the success of the three organizations are the various interfaces of the training organization with its source of trainees, its source of funds, and its source of employers. That is, each organization may experience different rates of "success" partially due to its unique relationship with persons in the Plan management (President and Coordinator's Office), the unions and the contractors' organizations.

Trainee Evaluation of the Pre-apprentice Program

Another means of ascertaining the degree to which the training organizations were successful is to ask their former trainees to provide a subjective evaluation. This was done through the use of the field survey. (See Appendix B.) While we consider the data to be poor and biased in unknown directions, the following tables are presented more for information than as definitive criteria on which to base any conclusions. The tabulation of their responses by organizational affiliation is shown below.

Q: Did the Pittsburgh Plan training program help you pass the union test?

	% response			
	Took no tests.	Not at all helpful.	Helpful, but could have passed without it.	Very helpful.
BID (N=6)[1]	50	17	33	-
DIG (N=29)	14	7	28	52
OIC (N=13)	8	8	46	38

[1] N is the number of responses.

Q: Was what you learned in the Pittsburgh Plan training program helpful in doing your union job well?

	% response		
	Not at all helpful.	Helpful, but could have done without it.	Very helpful.
BID (N=5)	20	20	60
DIG (N=30)	23	13	63
OIC (N=4)	7	29	64

Q: Do you think that you would have been in the union training program had you not been in the Pittsburgh Plan training program?

	% response	
	yes	no
BID (N=7)	14	86
DIG (N=33)	–	100
OIC (N=15)	–	100

Q: Was what you learned in the Pittsburgh Plan pre-apprenticeship training program helpful in doing your classwork? (union class)

	% response			
	Not in PAP	Not at all helpful.	Helpful, but could have done without it.	Very helpful.
BID (N=14)	36	7	21	36
DIG (N=62)	26	10	24	40
OIC (N=24)	25	4	29	42

SUMMARY

The three training organizations in Pittsburgh have functioned primarily to provide remedial academic and vocational training to minority individuals and to place them in the building trade unions. Persons utilizing these services through full-time enrollment in a 25-week course constitute the "pre-apprentice" population. Another group of minority individuals, while not enrolled in pre-apprentice training, utilizes some placement services provided by the organizations and the Pittsburgh Plan's contacts with the unions in seeking union membership. These individuals are the "direct placements". The same staff at each organization provides these services to both populations. The organizations have served approximately equal numbers of persons and have provided essentially the same services, the notable exception being in curricula. Only two organizations have provided training to obtain high school equivalency certificates and only one has provided actual training in building crafts.

Recruitment has functioned to contact as many persons interested in construction industry employment as possible. These contacts (especially those entering the pre- apprentice courses) are usually screened by the organization directors or counselors. The unions' stated minimum requirements are usually the only selection criteria employed. The pre-apprentice training which appears to have been most effective, as evidenced by percentage of placements in union training, is that provided at one organization which accepts mostly persons with a high school education (or the equivalent) and places most of its effort in preparing the trainees for the specific tests, interviews and other selection procedures employed by particular unions.

CHAPTER 3

UNION PLACEMENT

The interface between the unions and the Pittsburgh Plan program is twofold. The first area of interaction is the entry process which occurs once for each attempted union placement.[1] Following each successful placement an ongoing process, the active follow-up of trainees, constitutes the second area of interaction.

UNION ENTRY

Each building trade union operates its own mechanism which provides for entry into training. The processes encompassed by this mechanism can include any combination of the following: formal application, testing,[2] interview and probationary work period.[3]

The most striking distinction between the entry procedures employed by the various unions is the degree of formality involved. In general the larger unions which must accept and process a larger number of trainees each year have a more standardized, inflexible and formal entry mechanism. Interviews have indicated that Pittsburgh Plan staff prefer to work with such formal entry structures (and have higher expectations as to the results to be obtained for these unions).

The smaller unions, some of which do not accept trainees each year,

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[1] The negotiating of union slots for minorities is another interface which is active once each year.

[2] The training organizations have usually paid the required fees associated with testing and application.

[3] At present required only by the Carpenter's Union.

tend to operate a much more informal and unpredictable entry mechanism. These unions have a greater tendency to make changes from year to year concerning which stages in the entry process (test, interview) are required. A common procedure among the more informal entry mechanisms is "referral" whereby through private communication a union contacts a source of trainees (such as the Co-ordinator's Office, Pittsburgh Plan). Applicants are then usually limited to Plan participants and the unions tend to accept whomever the Plan sends.

Another apparent factor relating to the entry mechanism is the existence of two types of union training programs; the regular apprentice program and the special on-the-job (OJT) program. The entry mechanism for OJT trainees tends to be less formal and structured than that for apprentices even within the larger unions which tend to operate standardized entry programs. A corollary is that the stated requirements for OJT entry are significantly less stringent than those for regular apprentice entry.

Once communication is received by the Co-ordinator's Office concerning available union training slots, whether through public announcement or referral, the three training organizations are notified. This immediately triggers the placement assistance process at these organizations. Mailings are sent out to all persons in the placement "pool" (see Figure 3, Chapter 2). Those who respond receive the full assistance of the organizations' placement activities. (See Chapter 2 for details of placement assistance.) In some cases information concerning availability of union slots has been restricted to one training organization (through direct contact from the union to a representative of that organization). This has been the exceptional case, however. A more common occurrence is that each organization sends more applicants than the total number of slots negotiated for minorities since the organizations do not find justification for restricting knowledge of the slots available or restricting the number of applicants.

Following the preparatory phase of placement assistance, the individual encounters the actual union-controlled entry process. Figure 1 in Chapter 1 displays this process in detail. A description follows of each phase of the entry process external to the Pittsburgh Plan program.

An active participant in union entry is the Apprentice Information Center (AIC), Commonwealth of Pennsylvania. AIC receives notice of union slot openings approximately one month before the deadlines for application and communicates the details to the Co-ordinator's Office, Pittsburgh Plan. Response from the Plan's potential placements is initially in the form of formal application for training. For some unions, AIC administers a general aptitude test. All test scores and applications are sent by AIC to the unions.

After receiving and reviewing these scores and applications, the unions notify applicants concerning oral tests (interviews). Some unions administer their own test prior to selecting those to be interviewed. Interviews are conducted by the Joint Apprentice Committee (JAC) which is composed of one-half union officials and one-half management, i.e., construction contractors. Each union has its own JAC. Interviewers rate the applicants on these criteria:[1]

a. previous work experience, particularly when it is related to the trade
b. good physical health, no physical defect to prevent performing the work of the trade
c. high school diploma or equivalent
d. good moral character
e. qualify on one or more aptitude tests
f. high school courses taken
g. attitude factors

All interview scores are totalled and individuals are ranked. As training slots become available the individuals are notified in decreasing rank order. While each union generally has one list for all accepted applicants, some unions place trainees from two lists, one for minorities and one for non-minorities.

In addition to trainees who are placed through the active assistance

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[1] For those people placed by referral these criteria obviously do not apply.

of the training organizations, some minority members enter the unions with the assistance of another organization or through their own efforts. These individuals are offered the follow-up counseling services of the Pittsburgh Plan, and if they accept, the Plan receives credit for providing these services.

TRAINEE WAITING PERIODS RELATED TO UNION PLACEMENT

The description of the entry process reveals the inherent delays which confront the potential union trainee. There are a maximum of five periods when applicants must wait for responses from the unions:

a. application to testing
b. testing to notification of test results
c. test results to interviews
d. interviews to notification of acceptance
e. acceptance to placement

These waiting periods, if extended, can obviously pose serious problems for applicants, especially those persons who do not have any short-term employment with which to sustain themselves for a period of months. In extreme cases it is likely that even those who have been accepted cannot afford to wait for placement and seek full-time employment outside the trade unions.

The Research Team attempted to obtain data relating to the duration of these waiting periods through the field survey (see Appendix B). Although the response rate for these particular questions was disappointing, the results are displayed below.

Q: How many weeks until you got results of test or application (for union training)?

mean response	4.2 weeks
median response	2.3 weeks
minimum response	0 weeks
maximum response	52 weeks
number of responses	80

40

Q: How many months after passing the test or applying for the union program were you offered an apprentice or OJT slot?

mean response	3.4 months
median response	1.7 months
minimum response	0 months
maximum response	24 months
number of responses	93

Because of the low response to these questions and also the somewhat ambiguous nature of the response requested (application or test) the Research Team gathered extensive data on dates of placement of PAP trainees and dates of various union entry processes from 1971 to 1975 (from the Co-ordinator's Office). In conjuction with the date of the last day of training (DOL MA-102 form) the data were used to compute two waiting periods. The results are the following:

waiting time* (in weeks)	mean	minimum	maximum
application to placement	21.2	5	71
PAP exit to placement	13.7	0	83

*Based on data for 89 PAP trainees. Many trainees (approximately 72% of the sample) applied before exiting the PAP and some were placed immediately upon exit.

It should be noted that although these data describe typical waiting periods experienced by placements, they are based on records only for those who were successfully placed. Similarly the responses tabulated from the field survey were from only successful placements. Comparable data were not available for those who had failed to be placed. The data presented thus fail to explore any possible relationship between the duration of the waiting periods and placement failures.

An interesting result of the analysis of PAP waiting periods is the large percentage of persons placed (72% of our sample) from the PAP program who are able to submit their applications before leaving PAP training. The sample indicates that on the average these people are able to be partially

sustained through training stipends for 7 or 8 weeks of what would otherwise be a waiting period with no income.

NUMBER OF UNION PLACEMENTS

The negotiations between the Black Construction Coalition, western Pennsylvania building trades unions and construction contractors were brought to resolution on October 13, 1970. As of this date an agreement had been established that blacks would begin to enter the building trades unions of western Pennsylvania in large numbers resulting in 1250 blacks becoming journeymen by the end of 1974. As of December 31, 1975, there were 808 union placements validated by the OFCC, and 94 of them received their journeyman's book. A glaring discrepancy exists between the negotiated 1250 journeymen and the 808 placed in union training. In the absence of cooperation from the unions, the Research Team, after discussions with Plan management staff, has formulated the following reasons for the failure to reach the agreed upon representation by blacks:

(1) The general construction industry market was depressed throughout the program's history (1971-1975)[1]

(2) Slots in the union were lost[2] because:

   a. inadequate knowledge on the part of the trainee of the building trades unions and the trades' work environment

   b. an insufficient number of people present for union screening proceedings (application, testing, etc.)

The first cause was clearly beyond the control of the Pittsburgh Plan staff. However, the union screening process eliminates roughly 60% from

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[1] See Table 14 in Chapter 4.

[2] Slots are filled once a "placement is made", once a trainee is sent out to a job and is validated by OFCC. Having been filled, a slot cannot be re-negotiated if the individual is terminated.

consideration for placement.[1] Therefore for every slot desired to be filled at least an average of 2.5 potential placements must go through the screening process. Thus, for example, when fewer people show up for screening than there are slots available the lack of placements is not surprising. This has happened on one occasion (to our knowledge) with the Steamfitters union. Even assuming that the generally depressed market was the primary cause, there is little doubt that the second cause has added, even if marginally, to the number of unused slots.

UNION PLACEMENTS-DESCRIPTION

The field survey (see Appendix B) was instituted primarily to obtain detailed information concerning the Pittsburgh Plan's most important product, its placements in union training. The Research Team hoped to apply analysis of variance techniques to the collected data to form models including the various factors contributing to success beyond placement (toward journeyman status). The high percentage of missing responses for many of the survey questions has made this an impossible task. (See Chapter 4 for further discussion.) This section discusses in a less rigorous fashion those factors which appear to be associated with success in remaining in union training. The results apply to both placement types, PAP and direct, unless otherwise stated. The PAP-direct distinction is not emphasized because there is no reason to suspect that route to placement affects the processing of individuals once they have been placed in union training.

A breakdown of the surveyed population is shown below. (N is the number of persons surveyed in each catagory. Percentages of column and row totals are shown in parentheses and brackets respectively.) Two analyses were performed which provide a base for the following discussion. Responses to all survey questions were cross-tabulated with each cell in the survey breakdown. In addition a correlation of total months in union

[1] The percentage varies depending on the difficulty of the union test(s) and the interview.

Table 5 Current Status in Union Training Programs PAP vs Direct Placements

	terminated	onboard	%
PAP	N = 18 (53) [28]	N = 47 (34) [72]	[100]
Direct	N = 16 (47) [15]	N = 92 (66) [85]	[100]
%	(100)	(100)	

training with responses to all survey questions was performed for each year's cohort of placements from 1971 to 1974. Those variables which have consistently significant correlations for all or most cohorts are assumed to be related to progress toward the journeyman's book.[1]

The first set of variables considered are those related to the trainee's backgroumd prior to entry into the Pittsburgh Plan program. These may be considered to be potential perscriptive variables in that they can be related to recruitment and selection decisions. Those persons staying onboard in union training tend to have experienced more unemployment during the full year prior to Plan entry (PAP placements only), held less full-time jobs since leaving public school, held less part-time jobs and spent a shorter time on any one part-time job. Successful trainees also tend to be more educated and primary wage earners. This would seem to indicate that those successful had a background with less job instability. (Those onboard and terminated reported very nearly the same total number of years of full-time employment.)

Another set of responses related to remaining in union training are those resulting from the initial job experience. Successful trainees reported remaining longer at their initial pay rate. This probably does not indicate that they received pay raises at a slower rate, but that many

[1] See Appendix B for description and cross-tabulation of these variables.

of those who are terminated left training before receiving any pay raises (about half of those terminated report this). The response to time employed in union work (both full months per year and employment during each season of the year)indicate consistently less employment for those terminated, however this possibly reflects two separate tendencies in the data. While those terminated might have experienced less time worked per year than their successful counterparts, a confounding factor is that the median length of stay for those terminated (in the survey sample) is 10 months. This does now allow a valid comparison of employment for the two groups.

The survey asked trainees to compare their job in union training to those previously held. Successful trainees were significantly more likely to give favorable ratings to the union job overall, and especially in terms of friendliness of co-workers and pay scale.

From the responses of trainee problems regarding work attendance, successful trainees reported significantly fewer difficulties with slow transportation and less reliance upon means of transport other than their own automobile.

Other indications, while less statistically significant, are that successful trainees tended to: (1) not be military veterans; (2) not have experienced other Federal manpower programs; (3) be married; (4) not have experienced disrupted marriages (direct placements only); (5) be heads of households; (6) not have been on public assistance prior to Plan entry; (7) have had a superior prior knowledge of the construction industry (direct placements only); (8) have had friends or relatives employed in building trades construction prior to Plan entry. Successful PAP placements tended to have not had vocational training prior to Plan entry while successful direct placements tended to have had such training.

JOURNEYMEN

Of the 808 individuals placed in various training programs the Pittsburgh Plan had 94 individuals who by December 31, 1975, received their journeyman's book. This, in some sense being the highest goal for the Plan deserves

attention by itself. To begin with, the surface or gross percentage of journeymen (11.6%) is a very misleading figure since it does not reflect the varying length of service for different cohorts. Or again, the gross percentage journeymen in each of the two categories of placements PAP (4.3%) and direct (15%) does not take into consideration the age structure of, and the program constraints operating upon, the two groups.[1] Using some simple statistics, we shall briefly discuss the effect of varying age structure, program type requirements and factors such as prior experience on the rates at which placements are receiving their books.

While there are as many as nine different entry routes to journeymen status,[2] the three attempted channels for Pittsburgh Plan placements are as follows: 1) in the union apprentice program generally for those under 20 years of age, 2) OJT program generally for those over 20 years of age and/or those with some experience in the trade, and 3) "instant" journeyman being those who have had considerable experience in their craft and for one reason or another did not obtain their books previously.

In order to facilitate reasonable accuracy in our discussion, we have grouped together unions with similar minimum length of service requirements. Information on the stated requirements for journeymen for various unions was gathered from a local organization, the Apprenticeship Information Center, which states that there are unions with a three year requirement, a four year requirement and a five year requirement. For convenience we shall refer to the three groups as three year, four year and five year unions.

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[1] The majority of PAP placements are Apprentices in contrast with direct placements who are mainly in the OJT program. The fundamental differences between the requirements and characteristics of the two training types has great significance in accounting for the variations in number of journeymen. A parallel presentation could have been made for Apprentice and OJT trainees. However, for reasons cited in Chapter 5 we shall not discuss these two sub-groups separately. The differential representation of placement type in the two training programs still, in some measure, allows us to apply the results of this analysis to the two training program types.

[2] Dubinsky, Irwin (1973) pp. 29-36

To serve as a basis for the discussion that follows, Table 6 gives a few statistics for different groups of placements taking into consideration both union requirements and the age structure of the population (or group) under consideration. To interpret these figures consider the first row for all placements in three year unions. Of the maximum possible number (129) of people who could have met union requirements (i.e., those who were placed prior to 1974), 16.28% received their books, 42.64% were terminated and 41.08%, theoretically satisfying union requirements have yet to receive their books. The last figure (9.09%) gives the percentage of all journeymen in three- year unions who received their books before they had satisfied the time requirements.

Comparing these percentages across different sub-populations clearly shows the superior representation of journeymen in direct placements. The major reasons for this appear to be:

1. the lower failure rate for this group across all union types; and
2. the percentage of those who because of prior experience, especially in construction work, receive additional seniority and thus receive their books before the required time has elapsed.

The first reason can be attributed primarily to the difference in characteristics between the two populations, differences which are controllable. As stated by one participant, the prime characteristic necessary for success in union training programs is maturity and discipline. Such intangibles, perhaps incapable of being quantified, can nevertheless be estimated (via for example, interviews) and more mature and disciplined pre-apprentice trainees could be processed for union placement. On the other hand, the second reason shows that there is perhaps little that can be done to improve the overall performance of PAP placements since factors such as experience are inherently biased against the PAP placement who is on the average, 10 years younger than the direct placement. Discussions with various persons involved with the Pitts-

Table 6 Status of Union Placements for Selected Sub-groups

POPULATION TYPE	MAXIMUM #	% JOURNEYMEN	% TERMINATED/ QUIT	% STILL ON BOARD	% OF ALL JOURNEYMEN IN POP. NOT MEETING STATED REQUIREMENTS
ALL PLACEMENTS IN 3 YEAR UNIONS	119	16.81	40.34	42.85	11.76
ALL PLACEMENTS IN 4 YEAR UNIONS	148	22.97	39.19	37.84	64.71
ALL PLACEMENTS IN 5 YEAR UNIONS	41	46.36	19.51	34.15	25.00
PAP PLACEMENTS IN 3 YEAR UNIONS	44	9.09	52.27	38.64	0.0
PAP PLACEMENTS IN 4 YEAR UNIONS	51	13.73	56.86	29.41	0.0
PAP PLACEMENTS IN 5 YEAR UNIONS	19	0.0	26.32	73.68	0.0
DIRECT PLACEMENTS IN 3 YEAR UNIONS	75	21.33	33.33	45.33	11.76
DIRECT PLACEMENTS IN 4 YEAR UNIONS	97	27.84	29.90	42.26	75.00
DIRECT PLACEMENTS IN 5 YEAR UNIONS	22	86.36	13.64	0.0	25.00

burgh Plan confirms our view that a major reason for the quantitative difference between PAP and direct journeymen is precisely this question of seniority and experience. In the face of this fact, decisions about the two types of placements have to be made on grounds different from the percentage of journeymen.

Another fact that is clear is the large percentage of placements in all sub-groups (except for direct placements in 5 year unions) who, in terms of years of training, are qualified for their books and have yet to receive them. The main reason for this is that union requirements are for both the minimum number of years in training as well as the number of hours on-the-job training. This latter figure is usually 1000 hours per year of training required. With the general depression in the local construction market (see Table 14, Chapter 4, for the percent of unemployment in Pennsylvania between 1971 and 1975), many placements have not had the required cumulative total of 1000 hours per year of training. Once again direct placements have a distinct advantage over the younger PAP placements. Especially in times of lowered employment opportunities, the unions and contractors will give the most job opportunities to the more experienced individual. One would be hard put to argue that this lack of experience is inherently a black mark for PAP placements.

At the same time, it is perhaps worth mentioning that such effects of a depressed economy on manpower programs in general and hometown plans in particular may require special policies. Some mechanism may need to be instituted whereby these effects if not negated, may at least be mitigated. Finally, while extremely difficult to inforporate into such quantitative analyses as have been reported here, the sometimes major impact of the economy on such programs as the Pittsburgh Plan need to be kept in mind during evaluation.

This is not to argue that there are no discretionary differences (i.e., those that can be exploited) between the two groups. Clearly direct placements are better at getting into a union and once in better at receiving their books and at avoiding being terminated. The monotonicity of this relationship is absolute. For a detailed study of the failure rates among Plan participants see Chapter 5.

In conclusion, if one assumes that when construction work in this area

returns to its normal state, individuals will receive their books on time,[1] the general picture of journeymen is far less discouraging. Using this assumption, the expected number of journeymen for the above groups is given below. While this is perhaps a naive assumption, the results clearly show that the Plan is doing much better in terms of journeymen than is apparent from gross data.[2]

All Placements - 3 year unions	57.36%
All Placements - 4 year unions	61.44%
All Placements - 5 year unions	80.44%
PAP Placements - 3 year unions	47.73%
PAP Placements - 4 year unions	43.14%
PAP Placements - 5 year unions	61.54%
Direct Placements - 3 year unions	58.82%
Direct Placements - 4 year unions	71.84%
Direct Placements - 5 year unions	86.36%

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[1] This implies that there will be no attrition after the required time has elapsed.

[2] Further note that we have retained the same rates of failure even during better economic times - an unlikely circumstance which might compensate for the assumption of zero failure rates after a certain time.

THE FOLLOW-UP COUNSELOR/FIELD SUPERVISOR PROGRAM

The follow-up counselors are and have been from the start an integral part of the Pittsburgh Plan. However, in 1972 with funding from other sources a Field Supervisor program was begun. The initial intent was that the follow-up counselors would be exclusively devoted to follow-up and the field supervisors to on-the-job (field) visits and crisis management. However, over the years the two functions have so deeply co-mingled that such a distinction is almost meaningless. In what follows the term field supervisor is used generically to denote both follow-up counselors and field supervisors.

Under the direction of the President of the Administrative Committee of the Pittsburgh Plan, the Field Supervisor team is designed to fulfill three major objectives:

1) add proficiency to trainee work habits
2) provide the trainees with a more harmonious work atmosphere
3) gather follow-up information.

The team members are hand picked by the President of the Administrative Committee. They ideally possess a few years experience in the building trades, a keen sense for solving racial problems and the ability to maintain good rapport with union foremen and business agents.

The Field Supervisors report to the Plan's management on

1) the number of minorities hired at each construction site involving union contracting
2) the results of discussions with officials of construction contractors who handle E.E.O.C. complaints
3) the results of pre-job compliance meetings, Joint Apprenticeship Committee meetings and Pittsburgh Plan Placement Committee meetings and
4) the amount of recruitment performed by the training groups per month.

The Field Supervisor Team submits monthly narratives to the Administrative Committee containing information on the employment status of the various

trainees, complaints of the trainees on various aspects of the program and results of steps taken to amend trainee difficulties.

Daily activities of the field supervisors include screening, recruiting, placement, counseling and follow-up. Although the amount of time allocated to each of these activities varies from field supervisor to field supervisor the majority of time is spent gathering actual follow-up information. The next to largest allocation of time is counseling placed trainees. The remainder of their time is divided between recruiting, placement and screening.

Initially, recruiters were set apart from the function of Field Supervisor. Their sole purpose was to notify the surrounding communities of union openings and the Pittsburgh Plan training program. As the public awareness of the Pittsburgh Plan increased, recruitment began to handle itself. At this stage, the task of recruitment was informally given over to the Field Supervisors.

The technique of recruitment used by the Field Supervisor is primarily through contacts with already placed trainees. Screening and placement are other informal functions of the Field Supervisors. Because of the understanding the Field Supervisors have about the demands of particular unions they are inclined to know the kind of person who will make it in specific unions. They aid prospective trainees in preparation for oral interviews with the unions as well as try to discourage those applicants who they see as potential failures from applying and taking a slot which may be more secure in the hands of another trainee.

The remainder of the Field Supervisor's time is divided between counseling and following-up on already placed trainees. While the actual gathering of follow-up information requires more of the Field Supervisor's time than the counseling of placed trainees, the latter is a more crucial duty.

Counseling almost always occurs only when a trainee is on the verge of termination. The Field Supervisors are thus crisis oriented. Once it has been brought to the attention of the Field Supervisor that one of the trainees is having difficulties, he goes to the job site and discusses the problem with the trainee, the foreman and the union steward. If the problem cannot be solved at this level, the Field Supervisor then takes it to the contract construction agent. If the problem cannot be solved at this level a Joint

Apprenticeship Committee meeting is held, usually with the trainee present, to discuss a plan of action.[1] Here the trainee is either terminated or shifted to another job site where the conflict can be avoided.

SUMMARY

Although the three training organizations exist primarily to prepare persons to enter union training, the actual entry process is under the unions' control. Trainee selection is usually performed through some combination of formal application, testing and interviews.

The negotiations which initiated the Pittsburgh Plan called for 1,250 minority journeymen to be added to union membership be the end of 1974. As of the end of 1975, there had been 808 persons placed in union training and 94 of whom had received their journeyman's book. A primary reason for this small number of journeymen is the downturn in the construction industry during 1971-1975. Another reason is that many placements have not been in training long enough to meet the 3 to 5 year requirement. Those individuals placed directly into union training have been more successful in reaching journeymen status than have the pre-apprentice placements.

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[1] The following table lists those unions which allow trainee presence at JAC meetings. It is important to note that the respective training organizations have different relationships with the unions. For example, while DIG is allowed into the Asbestos JAC meeting, OIC and BID are not. Similarly, there are unions which allow OIC into JAC meetings and not DIG or BID.

Unions allowing Field Supervisors to be present at JAC meetings	Unions not allowing Field Supervisors to be present at JAC meetings
Electrical Workers	Asbestos Workers
Elevator Constructors	Boilermakers
Ironworkers	Bricklayers
Lathers	Carpenters
Operating Engineers	Cement Masons
Painters	Glaziers
Plasterers	Roofers
Plumbers	Sprinkler Fitters
Sheetmetal Workers	Stone and Tile Mason
Steamfitters	

Assuring that those minorities placed, and therefore filling a negotiated slot, remain in union training to become journeymen is crucial to the success of the Pittsburgh Plan. By providing the needed counseling and assistance to union trainees the Field Supervisors are critical in at least reducing the number of potential terminations.

CHAPTER 4

SUCCESS PROFILES

One of the first ways and perhaps the simplest way of improving the effectiveness of any program is to improve the recruiting and selection procedures employed. In the absence of information the general tendency in the Pittsburgh Plan has been to reject only those who most obviously would not have qualified for employment in trade unions (for example a person physically incapable of working in union construction) and attempt to fill union training slots by sending in as many interested individuals as possible. In the next few pages we will discuss the various models that have been developed to assist in constructing a profile of the successful individual which in turn will be of use in determining selection and placement policies.

If the Pittsburgh Plan performed only one function there would be few problems associated with establishing a definition of success. As it is, the Plan is at the very least separated into three functional areas and four organizational entities. The functional areas are the Pre-Apprentice Program, the recruiting, preparation and placement process and the follow-up counselor/field supervisor program. (For a more detailed discussion of this see Chapters 2 and 3.) The four organizations involved are the Pittsburgh Plan Co-Ordinator's Office, Bidwell Cultural and Training Center, Opportunities Industrialization Center and Operation Dig. When one includes the Administrative Committee and the funding source the situation fast becomes a very complex one. Each of the three functional areas have different processes and in general their personnel are separate. Perhaps with the sole exception of the teaching staff most individuals do perform multiple activities. However, the primary association of an individual is with the functional area to which he is attached. More importantly the three areas have different inputs and outputs. Thus, given that each of the areas have different processes, inputs and outputs, there are, except perhaps for the top level management of the Plan, at least three different criteria by which to measure both staff performance and individual success.

To some degree the outputs of one functional area are the inputs into another. PAP trainees make up about 31% of all placements and by definition all placements are the input population for the follow-up counselor/field supervisor program. Combining this fact with the natural result that separ-

ate functions yield separate goals, it is apparent that analyses aimed at providing data for policy decision-making must be done using all relevant criteria of success. This is especially critical when, as is entirely possible, the traits characterizing the successful individual at one level (or area) may not be those characterizing the successful individual at another. Such a contradiction, if it exists, must be discovered and the implications explored. In a program where each functional area feeds into the other, one should not have selection strategies conflicting with one another.

A second consideration in defining success is the two distinct input populations placed in union training programs - PAP trainees and direct placements. To a large measure the two populations have different characteristics[1] with the PAP placements being younger with little work experience, lower income levels and higher education levels. In addition, the PAP placements have significantly higher failure rates as compared to direct placements.[2] All this indicates that the PAP-Direct differentiation needs to be maintained throughout such analyses.

At the level of the Pre-Apprentice Program, the definition of success is at best a hazy one. The program caters to essentially two types of people, those who are in need of GED (high-school equivalency) and those who have 12th grade or equivalent but are in need of some remedial training. For the first group there is a reasonably clear definition of success. However our data do not indicate who was in which process and the outcome within that process and thus the subset of individuals working toward a GED was not distinguishable. On the other hand the Department of Labor form MA-102 classifies the nature of termination into two types: (1) completed training objective and (2) did not achieve training objective. (A copy of this form is reproduced in Appendix A.) Within the first there is a finer division between those who completed the full course, those who completed it early and those who accepted a full time job. Therefore, depending upon the perspective of an individual, success could even at this level be defined in a variety of ways. The Pittsburgh Plan Co-Ordinator's Office and presumably the DOL use the DOL MA 102 form's definition of success. However, we have chosen to maintain the distinction (albeit only roughly) between those who went through

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[1] See Chapter 3 for a description of the two populations.

[2] See Chapter 5.

the training program after obtaining their GED's or successfully completed the course for remedial education and those who left the program for a job without making full use of the training aspect of the PAP. This becomes an important difference if it is acknowledged that training should result in a change in the person's characteristics especially with reference to employability. For the convenience of exposition,we will call those who either completed the full course or completed early as successful by Definition 1.a and those who either completed the full course, completed early or left prematurely for a full time job as successful by Definition 1.b.

Taking into consideration all of the above factors the following definitions were formulated:

1.a. Successful completion of the PAP defined as completing the full course or completing early.

1.b. Successful completion of the PAP defined as full completion, early completion or premature departure for a full-time job.

2. Placement in a union training program (apprentice or On-the-Job Training) given the individual was a PAP trainee.

3. Placement in a union training program (apprentice or On-the-Job Training) given that the individual was a direct placement.

4. Receipt of a journeyman's book given that the individual was a PAP placement.

5. Receipt of a journeyman's book given that the individual was a direct placement.

What follows is a brief description of the data used, the methodology employed and descriptions and discussions of the various models developed for each of these definitions.

DATA

To obtain these success profiles we used two sets of data. The first set consisting of 776 observations was obtained from Department of Labor forms MA-101 (Applicant Information Record) and MA-102 (Individual Termination/ Transfer Report). The data were processed and the variables recoded or created so as to be useful for analyses. The resulting data set contained 35 variables which can be roughly classified into three sets: those measurable before entering the training program, those derived from the process of training (absenteeism and type of termination) and those describing the state of the individual after termination from the program. For a detailed discussion of

the derivation and the quality of this data (called for convenience MA-101 - MA-102 data) please see Appendix A.

The second set of data was obtained via a survey questionnaire administered to union placements whether on-board or terminated. The administration of the survey proved to be extremely difficult with the result that despite the enormous amount of person-hours spent in obtaining these surveys, we were able to obtain only 173 reasonable observations. Among these observations most of the questions were very sparsely answered and thus the majority of the data could not be used for any rigorous analysis. However, based upon the analyses of the MA-101 and MA-102 data, some a priori assumptions of significance and considering the percentage of missing values, 22 variables were isolated and this subset of the data was subjected to analysis. For a detailed discussion of this data, generally to be called the survey data, see Appendix B.

METHODOLOGY

Referring to the various definitions of success discussed above, it is obvious that all of them are dichotomous or binary in nature. The dependent variables derived from these definitions can take on at most two values. For example, a person either completed the PAP successfully or he has not. Similarly, an individual has either received his book or he has not. In such circumstances, many of the standard techniques of analysis such as ordinary least squares theory are not only inadequate but wrong.[1] In addition, there is probably no way of knowing exactly (i.e., in a deterministic sense) if a particular individual, given that he has certain characteristics[2], will be successful or not. This leads us to be interested in the conditional probability of success given that the person has a set of characteristics. We are thus led to postulate a purely probabilistic model of success. Of a variety of such models available, the model known variously as Conditional Logit, Logit or Logistic model was accepted. A program was written to estimate the parameters of this model and after adequate testing was employed in estimating the desired parameters. A detailed discussion of the failure of traditional least squares theory, the justification and derivation of the logistic model

[1] Perry, Wayne D., "General Quantitative Models and Policy Analysis of Turnover and Attendance in Manpower Programs", Unpublished Ph.D. Dissertation, Carnegie-Mellon University (1975).

[2] As manifested by the values of variables hypothesized to be of significance in explaining success.

and the estimation procedure employed are presented in Appendix C.

Due to data restrictions some of the definitions of success were not analyzed. Of the rest a variety of models were tested. In general these models conceptually fall into two categories--prescriptive and descriptive. The former models use those variables which can realistically be used as selection criteria. The latter contain in addition, sets of variables whose values are determined ex post facto and thus cannot in any real sense be used as screening variables. For example, the percentage of days absent in the PAP program would, a priori significantly affect success at the PAP level. However, since its value cannot be known before the individual joins the program, its presence is mainly descriptive in an analysis of success in the PAP. By the same token certain variables in the descriptive set at one level can be in the prescriptive set at another level. For example, the percent days absent can be used as a criterion variable when selecting individuals from the PAP for union placement. Thus, beyond the first process for any group (i.e., the PAP for its trainees and union screening and selection for direct placements) certain variables, originally ex post facto can become criterion variables. However, such variables cannot be used for initial selection and recruitment of individuals entering their first process. Therefore a prescriptive model based on such variables is useful only after the individual has been in the Plan as a part of at least one of its processes, and from a more global prespective is useless in suggesting strategies for selection. As an example, while the percent of days absent can certainly be used as a criterion for selecting PAP trainees for union placements, it cannot be used as a criterion for selecting the individuals most likely to be placed in a union before they even enter the PAP. Since union placements are the primary purpose of the PAP, it was felt that simple prespective models should be tested with only demographic types of explanatory variables. Whenever applicable both types of prescriptive models were tested and are reported.

THE PRE-APPRENTICE PROGRAM

As discussed above we have defined successful completion of the PAP in two ways. First we will consider models developed using Definition 1.a, i.e., a person was termed successful if he completed either the full course or completed early. Thus the dependent variable (TBIN) was binary taking a value of 1 if the individual was successful and 0 otherwise. For convenience of exposition all variables will be referenced by their mnemonics, a list of which along

with brief descriptions is on the next page. (For a more complete description, see Appendix A.)

In Model I all explanatory variables were of the demographic type. To begin with the overall model appears to be significant at the 95% level.[1] The most significant variables governing success are AGE, MAR 2, PWAG, LGENSK and LINC.[2] Of these AGE and LINC affect the probability positively and the rest negatively. The next set of significant variables are HEAD, DEPS, GRADE, LCONSK and LGENUN. Of these HEAD, GRADE and LCONSK are positive with DEPS and LGENUN negative. Essentially, the successful individual appears to be one who is older, better educated, has a higher income in the year prior to joining the program and whose last occupation was in the construction industry as a skilled worker. The less successful individual appears to have had some marital problems (insofar as it is measured by MAR 2), is the primary wage earner, has more dependents and has generally worked in general industry either as a skilled or an unskilled worker. Why a skilled worker in general industry should be more prone to failure is not immediately apparent. A tentative explanation offered is that such an individual may have entered the PAP as a stop-gap measure between jobs and that he would leave the program when offered a more lucrative position. This hypothesis is, however, not confirmed by Model IV discussed below, where premature departure for a job (here a failure) is considered a success. The effects of PWAG and DEPS appear at first blush to be contradictory with the effect of HEAD. However, the stipend paid to trainees is low and the pressure of being a wage earner with many dependents may well be great enough to warrant unsuccessful termination. Thus keeping in mind that variables not classified as significant may be thought of as having little or no effect, the above profile does not contradict a priori expectations.

In Model II all variables in Model I were retained and three variables ABSPER, BID and DIG were added. All three new variables are very significant with a negative sign. HEAD, DEPS, GRADE, LCONSK and LGENUN which were significant in Model I are not significant and FED which was not, appears to be

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[1] The null hypothesis was that there was a population mean probability of success tested against the alternate hypothesis that each individual, given his vector of explanatory variables, had a different probability of success. For further details see Appendix C.

[2] All t-tests were one-tailed tests.

Table 7 Description of MA-101 and MA-102 Data

MNEMONIC	DESCRIPTION
AGE	Age in years
MIL	Military service status
MAR 1	Marital status - married
MAR 2	Marital status - divorced/widowed/separated
PWAG	Primary wage earner
HEAD	Head of household
DEPS	Number of dependents
WELF	On welfare
GRADE	Highest grade completed
PRJT	Previous job training
FED	Previous training in a federal training program
LCONUN	Last occupation - construction unskilled
LCONSK	Last occupation - construction skilled
LGENUN	Last occupation - general unskilled
LGENSK	Last occupation - general skilled
LWHITE	Last occupation - white collar
LMISC	Last occupation - miscellaneous
GAIN	Years of gainful employment
LINC	Income in year prior to entry
LUN	Length of last unemployment
DAYSATT	Number of days attended
WORK 1	Status upon termination-Working in a non-training related job.
WORK 2	Status upon termination-Working in a training related job.
TRG	Status upon termination-Scheduled for more training.
UNEMP	Status upon termination-unemployed
UNKN	Status upon termination-unknown
ABSPER	Percent days absent from PAP training
TBIN	Type of termination-Definition 1.a
ALTTBIN	Type of termination-Definition 1.b
BID	Organization dummy - BIDWELL
DIG	Organization dummy - OPERATION DIG
PBIN	Union placement status
OIC	Organization dummy - OPPORTUNITIES INDUSTRIALIZATION CENTER
MULTABSDIG	ABSPER x DIG
ONBBIN	Current status in union training program

Table 8 Model I Pre-apprentice Program

DEPENDENT VARIABLE	TBIN	NO. OF OBSERVATIONS 776
VARIABLE	ESTIMATE	T-STATISTIC
CONSTANT	-1.333128	-2.424469
AGE	.4102848-01[c]	2.875459
MIL	.1352248-01	.1468033
MAR 1	.8360184-01	.6447091
MAR 2	-.6963143[c]	-3.965335
PWAG	-.4854011[c]	-3.893200
HEAD	.1915438[a]	1.429715
DEPS	-.5709987-01[a]	-1.301501
WELF	-.2948374-01	-.2729758
GRADE	.5918906-01[a]	1.617904
PRJT	-.5655799-01	-.5495627
FED	.8823313-01	1.092593
LCONUN	-.2210031-01	-.1290427
LCONSK	.3448063[a]	1.544635
LGENUN	-.1929596[b]	-1.677642
LGENSK	-.5674205[c]	-3.544517
LWHITE	-.1381195	-.9489192
GAIN	-.1680651-01	-.3362647
LINC	.8940805-04[a]	3.967421
LUN	.8693331-03	.4177916

$\chi^2 = 30.98$[b]

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

significant. With the exception of DEPS, no variable significant in either model shows conflicting signs. The fact that DEPS in Model II is not significantly greater than zero (the null hypothesis) reduces the contradiction implied in the conflicting signs. In order to understand why the set of significant variables differs between the two models, we observe first that all the variables which differ are significant only at the 90% level, the sole exception being LGENUN which is significant at the 95% level. Secondly, the general cause for such a phenomenon may be that variables that changed were in some sense standing instead of ABSPER, BID and DIG. The correlation coefficients between these variables tend to confirm this idea only in the case of GRADE and FED. The overall significance of the Model II (as estimated by the chi-squared statistics) is much greater than that of Model I. Clearly these variables add a great deal to the model. Also, the stated reason for most unsuccessful terminations, absenteeism, is borne out by the results. Both organization variables BID and DIG are significantly negative in their effects with DIG being the more negative.. However, as will be seen later, this appeared to be abnormal in that BID was less negative than DIG. Both differences in the percentage of successful trainees and information gleaned from interviews indicated that in general DIG ought to be less negative than BID. Thus the reversal in this case indicated some interaction between DIG (or BID) and ABSPER. This indication was further reinforced by the fact that DIG was correlated with ABSPER almost twice as highly as, and in direction opposite from BID and OIC; to test this, a simple multiplicative model was postulated and Model III was estimated. The additional variable MULTABSDIG was derived by multiplying ABSPER and DIG and is significantly negative. As anticipated, with this interaction between ABSPER and DIG separately accounted for, the relative positions of DIG and BID are reversed conforming with expectations. LUN which was almost significant in Model II is, in Model III significant at the 90% level. Other than this there are no other changes between Models II and III.

Since the implications of these negative effects of BID and DIG[1] are serious an analysis of covariance was conducted.[2] It was found that there

[1] OIC was dropped into the constant term. When it was explicitly introduced, it was positive but insignificant.

[2] See Appendix C for further details.

Table 9 Model II Pre-Apprentice Program

DEPENDENT VARIABLE TBIN		NO. OF OBSERVATIONS 776
VARIABLE	ESTIMATE	T-STATISTIC
CONSTANT	.2169289	.3848137
AGE	.2962463-01[b]	2.023200
MIL	-.1273701-01	-.1360399
MAR 1	.3307983-01	.2522918
MAR 2	-.5211884[c]	-2.923754
PWAG	-.4634383[c]	-3.832962
HEAD	.1070751	.7912909
DEPS	.9363219-02	.2091985
WELF	-.5951720-01	-.5204274
GRADE	.1041914-01	.2802260
PRJT	-.4805551-01	-.4419135
FED	.1066918[a]	1.296417
LCONUN	-.1938844-01	-.1120151
LCONSK	.2453922	1.089194
LGENUN	-.1197088	-1.025321
LGENSK	-.3506060[b]	-2.152331
LWHITE	-.1763898	-1.203326
GAIN	.8710025-02	.1709066
LINC	.6950281-04[c]	3.055848
LUN	.2318257092	1.098436
ABSPER	-.6203662-01[c]	-17.35393
BID	-.3315420[c]	-3.407324
DIG	-.4083238[c]	-4.187294

χ^2=158.44[c]

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

Table 10 Model III Pre-Apprentice Program

DEPENDENT VARIABLE	TBIN	NO. OF OBSERVATIONS 776
VARIABLES	ESTIMATE	T-STATISTIC
CONSTANT	.1927089	.3382457
AGE	.2264668-01[a]	1.530619
MIL	-.2691520-01	-.2846895
MAR 1	.1493057-01	.1128493
MAR 2	-.4790419[c]	-2.660115
PWAG	-.4376479[c]	-3.398840
HEAD	.9619428-01	.7045294
DEPS	.2610001-01	.5772772
WELF	-.2941903-01	-.3838353
GRADE	.7467412-02	.1986651
PRJT	-.6363937-01	-.6067216
FED	.1127591[a]	1.359844
LCONUN	-.1851389-01	-.1058239
LCONSK	.2645887	1.159248
LGENUN	-.8489394-01	-.7198955
LGENSK	-.3450224[b]	-2.101406
LWHITE	-.1697884	-1.145550
GAIN	.3263910-01	.6314369
LINC	.7481872-04[c]	3.249483
LUN	.3141422-02[a]	1.472701
ABSPER	-.5176961-01[c]	-13.40405
BID	-.3296172[c]	-3.406455
DIG	-.8136782-01	-.7110871
ABSDIG	-.4942748-01[c]	-5.478681

χ^2=170.2[a]

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

were no grounds for rejecting the null hypothesis that the parameters for organization specific models were the same. Even the test for difference in intercepts (the constant term) failed to reject the null hypothesis of equal intercepts. A plausible explanation for the relative positions of the three organizations as indicated by the analyses is that they reflect the percentage of successes per organizations in the data. They were 50, 57 and 58 percent for BID, DIG and OIC respectively, an ordering similar to the ordering indicated by the model. Further confirmation of this hypothesis is offered by the models developed for other definitions of success. In discussions with Plan officials we have learned that a possible explanation for these differences in the percentage successful is that Bidwell has, in general a less qualified and trained input population. This issue is not rigorously confirmed but there are indications that it is true. A detailed discussion of differences between the three organizations is in Chapter 2. A final point is the bias of the data. While we have no estimate of the bias with reference to TBIN, with reference to ALTTBIN our data are biased in favor of OIC as compared to DIG. (See Appendix A for further details.) We are unable to evaluate the implications of the bias in this case.

Models II and III are descriptive models and hence their results do not yield a meaningful selection profile. They do, however, offer some insight into the processes governing success in the PAP.

Models IV and V are similar to Models I and II except for the dependent variable. In this case the dependent variable (ALTTBIN) has a value of 1 if the individual either completed the full course, completed early or accepted a full-time job either in or out of the construction industry. In Model IV, the prescriptive model, we find that AGE, MAR 2, GRADE, PRJT, LGENSK and LINC appear to be the most significant. AGE, GRADE and LINC are positive and MAR 2, PRJT and LGENSK negative. Among the set of the next most significant variables are MAR 1, DEPS, LCONSK and GAIN with all but DEPS positive. First we note that there is no contradiction between the profile described by this model and Model I. The sets of significant variables do differ but a paired comparison (or intersection) of the two sets does not reveal any contradiction. Even those variables significant in one model and not in the other are consistent in the direction of their effects.

Neither does the descriptive model using this definition, reveal any contradictions. ABSPER is very significant. However none of the organiza-

Table 11 Model IV Pre-Apprentice Program

DEPENDENT VARIABLE	ALTTBIN	NO. OF OBSERVATIONS 776
VARIABLES	ESTIMATE	T-STATISTIC
CONSTANT	-2.363343	-3.977264
AGE	.6902420-01[c]	4.442652
MIL	-.8131276-01	-.8179575
MAR 1	.2069692[a]	1.480181
MAR 2	-.7767662[c]	-4.165202
PWAG	-.1500855	-1.146039
HEAD	.1703879	1.204444
DEPS	-.6204644-01[a]	-1.324209
WELF	.5314674-01	.6608309
GRADE	.1250092[c]	3.168725
PRJT	-.2447514[c]	-2.214080
FED	.9018025-01	1.036503
LCONUN	-.3936353-01	-.2126335
LCONSK	.3893008[a]	1.599999
LGENUN	-.1283311	-1.029997
LGENSK	-.4899071[c]	-2.844291
LWHITE	.6720066-01	.4235710
GAIN	-.9011152-01[b]	-1.674434
LINC	.1146393-03[c]	4.670045
LUN	-.7919064-03	-.3536150

χ^2=39.95[c]

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

Table 12 Model V Pre-Apprentice Program

DEPENDENT VARIABLE	ALTTBIN	NO. OF OBSERVATIONS 776
VARIABLES	ESTIMATE	T-STATISTIC
CONSTANT	-.8127297	-1.363386
AGE	.5261805-01[c]	3.390009
MIL	-.7584903-01	-.7678526
MAR 1	.6413628-01	.4603347
MAR 2	-.6395904[c]	-3.478544
PWAG	-.3871483-01	-.2907709
HEAD	.4958003-01	.3502037
DEPS	.3155756-01	.6692702
WELF	.3960490-01	.4952897
GRADE	.6361860-01[a]	1.623230
PRJT	-.2500370[b]	-2.300100
FED	.1352615[a]	1.570199
LCONUN	-.3201683-01	-.1750931
LCONSK	.2369319	.9858649
LGENUN	-.1488459-01	-.1203463
LGENSK	-.2540585[a]	-1.492112
LWHITE	.1730238-01	.1105930
GAIN	-.7953561-01[a]	-1.481093
LINC	.9809812-04	4.022538
LUN	.6860387-03	.3076392
ABSPER	-.6205382-01[c]	-17.39515
BID	-.4329234-01	-.4348088
DIG	-.3429428-01	-.3365793

χ^2=174.93[c]

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

tional variables are significant and interaction effects do not appear to be present. Just as in Model III (the equivalent of this model for the TBIN definition of success), FED is significantly positive. This contrasts with the prescriptive models for both definitions of success where, in both cases, FED appeared to be insignificant.

The successful person using this definition, appears to be older, better educated, married, with a higher income and last employed in the skilled construction industry. Conversely, the person with a low probability of success is characterized by an unfortunate marital history, more dependents, some previous job training, more years of gainful employment and last occupation in the general skilled category. The effects of previous job training and years of gainful employment are counter-intuitive. However, if considered with the negative effect of LGENSK it may be that the PAP program is far too low-keyed for individuals with considerable skilled work experience especially after already having undergone some job training. That these characteristics negatively influence success in a remedial and refresher type of program is therefore not surprising.

Combining the results of these five models reveals no contradictions. Since individuals successful according to Definition 1.a are a subset of those successful according to Definition 1.b, it would appear that the success profile indicated by Model IV is the most appropriate one to use. Yet, as discussed above, in so far as TBIN measures success in a more rigorous sense it requires completion of the training program), Model I might be the appropriate one to use for trainee selection.

UNION PLACEMENTS

Due to severe data restrictions, profiles of success were developed for only one type of placement. Ideally we would have liked to have constructed such profiles for the direct placement as well as the PAP placement. Unfortunately we had no data on individuals, who if they had been placed would have been in the direct placements category, i.e., we had no data on those individuals who were part of the set who either attempted to get into the PAP and failed and/or were recruited exclusively for union placements. The survey data we had did not contain information on those who were not successfully placed, and therefore, no success profile could be constructed for this half of the population, i.e., direct placements.

The data available permitted us to construct a success profile for union placement given that the person was once in the PAP program. These data were the same as those used in constructing profiles of success in the PAP. In these data, placements are overrepresented as compared to the entire PAP population. In addition, our data are biased in the percentage representation according to organizations. The former overrepresentation does not appear to have led to any bias, and as will be seen below, the latter bias has been captured by the analysis and thus the profiles derived from these data seem acceptable. Some attempts were made to differentiate between different unions and between different union training program types (i.e. the Apprentice program and the On-the-Job Training program). However, the lack of adequate numbers of observations per 'cell' prevented us from carrying out this detailed analysis. The dependent variable (PBIN) was defined so as to take on a value of 1 if the person was placed in any union training program and 0 otherwise.

Model VI was developed using all available demographic variables and is similar to Models I and IV. The overall model is significant at the 99% level, i.e., the hypothesis of a population mean probability of success was rejected at the 99% level. Variables AGE, MIL, DEPS, GRADE, LCONUN and LINC appear to positively influence success. Variables negatively affecting success are MAR 2, LCONSK, LGENUN, LGENSK and GAIN. The successful placement appears to be the older individual, with some military service, better educated, with a higher income level, last occupied in the construction industry as an unskilled worker and with more dependents. Assuming for the present that AGE and DEPS are essentially providing a measure of responsibility and maturity it appears from this set of positive variables that the union selection processes are indeed in conformance with their stated criteria. To recapitulate briefly the unions generally state that they seek the better educated, more responsible, more experienced (either in or out of construction), better trained personnel while offering special consideration to the veteran. However, we observe that those variables negatively affecting success (except MAR 2) appear to contradict the other half of these stated criteria. Historically, the less successful individual has been characterized by an unfortunate marital history, more years of gainful employment, with prior employment as a skilled worker (in either sector) or as an unskilled worker in the general labor market. (The effect of a disrupted marital life is not surprising or contradictory.) If we rank the parameters of occupation types we observe that the most likely

Table 13 Model VI Union Placement: RPAP Trainees

DEPENDENT VARIABLE	PBIN	NO. OF OBSERVATIONS 776
VARIABLES	ESTIMATE	T-STATISTIC
CONSTANT	-5.622698	-11.02872
AGE	.6277394-01[c]	4.944003
MIL	.2789181[c]	3.431263
MAR 1	.2085974-01	.1815038
MAR 2	-.2733938	-1.730422
PWAG	-.4344617-01	-.3888228
HEAD	.1196932	.9985401
DEPS	.7313321-01[c]	1.901832
WELF	-.1075820-01	-.1589224
GRADE	.2939063	8.544680
PRJT	.9171424-01	.9941059
FED	.1917104-01	.2606369
LCONUN	.2436394[a]	1.601808
LCONSK	-.2865354[a]	-1.436420
LGENUN	-.2579004[c]	-2.502958
LGENSK	-.6417704[c]	-4.433671
LWHITE	-.1091364	-.8388472
GAIN	-.1116733[c]	-2.479055
LINC	.1016572-03[c]	5.132176
LUN	.1513556-02	.8089189

$\chi^2 = 59.46^{c}$

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

person to succeed is the unskilled worker in the construction industry.[1] This, with the positive effect of LCONUN, confirms that the overall tendency appears to be a lower probability of placement for the more skilled person. The negative effect of GAIN is further confirmation that those with greater work experience (generally a characteristic of a skilled worker) have a lower probability of placement.

To explain these findings two hypotheses were suggested. The first was that the unions, reluctant to have minorities as union members and yet forced to have them in their training programs, reject the kind of person who is more apt to succeed in the training program. To begin with, note that we have no independent confirmation of the hypothesis. Secondly, discussions with people associated with unions and their training programs revealed that the unions had in some sense improved their attitudes over the years towards the presence of minority members;[2] and further that because all trainees whether apprentice or OJT have to work on job-sites, it would be in the self-interest of both the unions and contractors to select those individuals with more skill and greater experience. As a final point it appears that in general union journeymen who do the actual on-the-job training are reluctant to spend a lot of time and effort in training people. Again this implies that in so far as the union selection procedure reflects the desires of union members the unions would be seeking the more experienced and skilled individuals. In light of these conflicting reports it would appear that this hypothesis should be treated as a very tentative suggestion.

The second hypothesis was that due to the oftentimes long delay between completion of training in the PAP and union tests, selection and placement, many of those who can find alternative employment do so. There is some confirmation of this. Consider the following table containing figures of the percentage unemployed in contract construction and overall unemployment in Pennsylvania between 1971 and 1975. Assuming that during a recession in any sector of the labor market unskilled workers have higher unemployment rates

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[1]Since these three variables are a set of binary variables such that for any individual only one can have a value of 1 and the rest must be 0, the absolute value of the parameter can be used to rank the position of the variables.

[2]Interviews with Mr. Garfield Gardner of the Apprentice Information Center, (Bureau of Employment Security, Commonwealth of Pennsylvania, Pittsburgh, Pa.) some Pittsburgh Plan personnel and Mr. Elis McGruder, Pittsburgh Plan Co-Ordinator.

than skilled workers, it is not improbably that the unemployment rates were highest for unskilled construction workers followed by general unskilled workers, skilled construction workers and general skilled workers. Put in another way, the sector with the most number of job opportunities was general skilled followed by construction skilled, general unskilled and construction unskilled. This ranking of job opportunities is the prefect obverse of the ranking of the variables LGENSK, LCONSK, LGENUN and LCONUN. Further as shown below and in Chapter 10 those who obtain employment before they are placed rarely leave that job to either try for a union slot or accept a union slot if offered one. As a consequence those in sectors of the labor market with the lower levels of unemployment were less available for placement and hence the variables indicating these sectors appear to negatively influence the probability of success. In sum, the hypothesis that it is the length of the delay between training and testing and selection and placement that causes those with the best employment opportunities to accept employment outside unions is weakly confirmed.

Table 14 Unemployment Rate in Pennsylvania[a]

	1971	1972	1973	1974	1975
OVERALL UNEMPLOYMENT (%)	5.4	5.4	4.8	5.1	8.7
UNEMPLOYMENT IN CONTRACT CONSTRUCTION (%)	12.5	14.9	12.7	15.8	24.0

[a]From Pennsylvania Fact Sheet, Prepared by Labor Market Information Section, Research and Statistics Division, Bureau of Employment Security, Pennsylvania.

Model VII contains along with all demographic variables, ABSPER and TBIN, two variables which are the result of the training program (the former a process variable and the latter a result variable). Both are significant and with the expected signs. MAR 2, significant in Model VI is not significant but maintains the direction of its effect. All the other variables retain the magnitude and direction of their influence. The overall model is, however, far more significant (as indicated by the chi-squared value). This model confirms the profile of the successful person as derived from Model VI and in addition indicates that the person successful in the PAP has a much greater probability of being placed.[1] ABSPER, a variable critical in predicting

[1]To crudely estimate the influence of the PAP, consider a person whose other characteristics take a value of 0 (improbable though it is). Such an individual has a probability of .5 of being placed. However, if he were successful in the PAP i.e., if TBIN were equal to 1 all else remaining 0 his probability of success is .71.

Table 15 Model VII Union Placements : PAP Trainees

DEPENDENT VARIABLE	PBIN	NO. OF OBSERVATIONS 776
VARIABLES	ESTIMATE	T-STATISTIC
CONSTANT	-5.373988	-10.09974
AGE	.4795198-01[c]	3.637468
MIL	.2716839[c]	3.233674
MAR 1	-.1249424-01	-.1050713
MAR 2	-.8990530-01	-.5484470
PWAG	.1315758	1.129869
HEAD	.2086805-01	.1678013
DEPS	.9950931-01[c]	2.471770
WELF	-.1722349-01	-.2464805
GRADE	.2607197[c]	7.345826
PRJT	.1088356	1.134986
FED	-.9666298-02	-.1273824
LCONUN	.2567262[a]	1.639045
LCONSK	-.3836828[b]	-1.861323
LGENUN	-.1745994[b]	-1.645035
LGENSK	-.4300024[c]	-2.878869
LWHITE	-.1044736	-.7804266
GAIN	-.8677433-01[b]	-1.875230
LINC	.6930459-04[c]	3.375176
LUN	.1402174-02	.7258027
ABSPER	-.1412042-01[c]	-4.247529
TBIN	.8854019[c]	12.51051

χ^2=126.46[c]

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

success in PAP is here independently significant. This model therefore, could be used to aid selection procedures for union placements given that the population being chosen has already completed the PAP.

Model VIII is the descriptive model for this definition of success. In addition to all the variables contained in Models VI and VII variables WORK 1, UNEMP, UNKN, BID and DIG were introduced. To begin with, the overall model is significant at the 99% level. As shown, all non-demographic variables are highly significant. Of particular interest are the three status-upon-termination variables WORK 1, UNEMP and UNKIN. Clearly, once a person leaves the PAP without being placed the chances of his ever being placed are very poor. Note especially that it is the person who leaves the program for employment outside construction who is the least likely to ever be placed. Since there is no follow-up of the unplaced PAP trainee after the program is over, these negative results are not surprising.

Once again, the two organizational variables BID and DIG are both significant and negative. An analysis of covariance did not indicate that there were any fundamental differences between the three organizations. Using the logic outlined on pp.63-66 it appears that the parameters associated with these variables reflect the percentage of placements as indicated by our data. These percentages are biased against DIG and in favor of OIC. Reported data indicate that DIG had the highest percentage of PAP trainees placed, followed by OIC and BID. Therefore, if our data were more representative one would have expected DIG to have been the most positive, followed by OIC and BID. For a more detailed discussion of the differences between the three organizations and some causes for those differences, please see Chapter 2.

Model IX is identical to Model VIII with ALTTIBN (Definition 1.b) instead of TBIN (Definition 1.a). The general profile is in perfect accordance with the profile indicated by Model VIII. Two things are of special interest. First, this model is slightly less significant than Model VIII loosely implying that Definition 1.b is a poorer predictor of success. The second is the magnitude of the parameters for the two variables. To illustrate, assuming that all other characteristics take a value of 0, the probability of placement given that an individual was successful in the PAP according to Definition 1.a (i.e., TBIN) is .66. The similar probability using Definition 1.b is only .61. These results tend to confirm our hypothesis that there is a difference between success as measured by these two definitions and that the

Table 16 Model VIII Union Placements: PAP Trainees

DEPENDENT VARIABLE	PBIN	NO. OF OBSERVATIONS 776
VARIABLES	ESTIMATE	T-STATISTIC
CONSTANT	-2.791644	-5.114731
AGE	.7304378-01[c]	5.471788
MIL	.2649870[c]	3.092066
MAR 1	-.3169886-01	-.2622125
MAR 2	-.6628030-02	-.4013815-01
PWAG	.7664635-01	.6536089
HEAD	-.5044627-01	-.4087123
DEPS	.6485523-01[a]	1.590003
WELF	-.1331736[b]	-1.884086
GRADE	.1428712[c]	3.971111
PRJT	.1307666[a]	1.360356
FED	.2317237-01	.3020685
LCONUN	.1589993	.9961113
LCONSK	-.2750084[a]	-1.335369
LGENUN	-.1576737[a]	-1.453107
LGENSK	-.4237466[c]	-2.786229
LWHITE	-.6164960-01	-.4514034
GAIN	-.7786411-01[a]	-1.637038
LINC	.3205184-04[a]	1.529422
LUN	.3425353-03	.1746920
WORK 1	-1.846348[c]	-17.51856
UNEMP	-1.673350[c]	-19.79513
UNKN	-1.570234[c]	-14.17202
ABSPER	-.5180902-02[a]	-1.549156
TBIN	.6546218[c]	8.882438
BID	-.5849046[c]	-6.606578
DIG	-.3549356[c]	-4.016242

χ^2=274.00[c]

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

Table 17 - Model IX Union Placements: PAP Trainees

DEPENDENT VARIABLE	PBIN	NO. OF OBSERVATIONS 776
VARIABLES	ESTIMATE	T-STATISTIC
CONSTANT	-2.708101	-4.983222
AGE	.7720615-01[c]	5.782590
MIL	.2604595[c]	3.061456
MAR 1	-.3183309-01	-.2639949
MAR 2	-.2871205-01	-.1749725
PWAG	-.8084617-02	-.6944415-01
HEAD	-.3607837-01	-.2930283
DEPS	.6602023-01[a]	1.624054
WELF	-.1452005[b]	-2.064700
GRADE	.1397684	3.906734
PRJT	.1287715[a]	1.342767
FED	.3922053-01	.5150658
LCONUN	.1647624	1.038584
LCONSK	-.2667001[a]	-1.294130
LGENUN	-.1616102[a]	-1.499098
LGENSK	-.4541776[c]	-2.996994
LWHITE	-.7717147-01	-.5686557
GAIN	-.7931153-01[b]	-1.672817
LINC	.3756400-04[b]	1.799561
LUN	.4734630-03	.2426108
WORK 1	-2.013574[c]	-19.39154
UNEMP	-1.552648[c]	-17.57070
UNKN	-1.521020[c]	-12.46541
ABSPER	-.1036894-01[c]	-3.075231
BID	-.6525632[c]	-7.433985
DIG	-.3927178[c]	-4.465758
ALTIBIN	.4266913[c]	4.525209

χ^2=260.38[c]

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

difference probably lies in the fact that those successful according to 1.a have had more training than those successful according to 1.b.

JOURNEYMEN

In the final analysis, the effectiveness of the Pittsburgh Plan must be measured in terms of the number of minority journeymen in craft unions. Unfortunately, over the years, there have been very few Pittsburgh Plan placements who have become journeymen. Part of the reason is quite simply that the Pittsburgh Plan placements have not had the time to qualify for a journeyman's book. Union requirements range from three to five years of on-the-job experience with a cumulative total of 1,000 hours per year. For all intents and purposes, the Pittsburgh Plan started in 1971 and thus even optimistically, there could not be many journeymen by 1975. Under these circumstances, it was decided that some variable should be defined as a surrogate for journeymen. Since most unions automatically award a book to a trainee who had both stayed the number of years required and worked the number of hours required, it was decided that a reasonable approximation would be whether the individual was still on-board the union training program. However, as the analysis of failure (Chapter 5) shows, the number of failures or terminations from union programs is time dependent and hence those placed in later years who simply did not have the adequate length of time in which to terminate, would in a pooled sample, bias any result. These data were, therefore separated into 1971-1972 and 1973-1975 groups based upon the year of entry.

The data used were a small subset of the data collected from our survey. The remainder of the variables were discarded either because they were thought to be not significant or because the number of missing observations was far too great to be useful for analysis. The result was a set of twenty-one variables. The mnemonics used along with a brief description is given in Table 18. For further details on these data see Appendix B. Size limitations did not permit further partitioning of the data into PAP and direct placements. Fortunately, using the data gathered from forms MA-101 and MA-102 augmented with failure data obtained from the Pittsburgh Plan Co-ordinator's Office, we were able to develop some models of success for PAP placements alone.

With one exception, all models developed for this level of success were extremely poor. Except for the model based on survey data for the 71-72 group, the null hypothesis of a mean probability of success given the set of characteristics could not be rejected. Nevertheless, both for the sake of

Table 18 Description of Summary Data

MNEMONIC	DESCRIPTION
AGE	Age in years
MIL	Military service status
MAR 1	Marital status - married
MAR 2	Marital status - divorced/widowed/separated
HEAD	Head of household
DEPS	Number of dependents
WELF	Welfare recipient
GRADE	Highest grade completed
KNOW	Knowledge of construction industry before entering union
VOCTRG	Previous vocational training
FED	Previous training in federal training program
FRIEND	Friends in the construction industry
NOFULLJ	Number of full time jobs held
NOPARTJ	Number of part time jobs held
GRINC	Income grade in year prior to entering Plan
NOJBPL	Number of jobs in year prior to entering Plan
EMPL	Employment status at time of entering Plan
TYPE	Union training program type
RTE	Entry route (PAP or direct)
ONBBIN	Current status in union training program
YRIN	Year placed in union training program

completeness and for the meager information that they reveal these models are presented and briefly discussed below.

Model X was developed using survey data for 71-72 placements and is significant at the 95% level. We observe that variables AGE, MAR 1, MAR 2, FRIEND and RTE are all significant and positive. That both MAR 1 and MAR 2 are positive is puzzling. However, interviews with follow-up counselors and field supervisors revealed that the phenomenon while puzzling, did not surprise them. On the one hand, a married individual has the greater incentive to succeed and on the other, the strain on the family caused by the travel required by union jobs may well give individuals without such ties a greater chance to succeed. Note that in either case, it is the older person being considered, as the younger who are generally not married nor have been married (and thus by the above arguments more successful) do not force the two variables to become negative given their higher failure rates.

The strong positive presence of RTE as compared to TYPE is further confirmation of our assumption that the variable of interest was the type of placement rather than the type of training program that the individual entered. Negatively influencing success are variables MIL, GRADE, KNOW, FED, NOFULLJ, GRINC, NOJBPL and EMPL. Many of these effects flatly contradict the results obtained from the analysis of success both at the level of the PAP and of placements. Discussion with various Plan personnel has not yielded any further insight into the probably cause(s) of this phenomenon.

In Model XI, developed for the 1973-75 group of placements, we observe first that GRADE, KNOW and RTE are the only significantly positive variables. Variables MIL, MAR 1, MAR 2, WELF, VOCTRG, FED, FRIEND, NOFULLJ, NOPARTJ, NOJBPL and TYPE are all significant and negative.

Pooling the results of these two models reveals a plethora of conflict with variables MAR 1, MAR 2, HEAD, GRADE, KNOW and TYPE having conflicting signs. Eliminating those variables insignificant in at least one model, we are left with MAR 1, GRADE, KNOW and FRIEND. Except for FRIEND, the average values of these variables for the two groups (+/- the standard deviation) are close. It would seem that the 73-75 group possessed many more though less useful friends in the construction industry. As reported in the analysis of failure in Chapter 5, there does appear to have been a fairly distinct but unknown change between 1972 and 1973. These results tend to further confirm that such a change occured. We have as yet been unable to identify the cause(s)

Table 19 Model X Union Training Program 1971-72

DEPENDENT VARIABLE	ONBBIN	NO. OF OBSERVATIONS 63
VARIABLES	ESTIMATE	T-STATISTIC
CONSTANT	3.397439	1.738695
AGE	.5328137-01[b]	2.124587
MIL	-.7161042[c]	-2.767192
MAR 1	1.259440[c]	3.468180
MAR 2	1.564789[c]	5.558873
HEAD	.3692754	1.222430
DEPS	.4897951-01	.8794837
WELF	-.1464666	-.6653338
GRADE	-.2031933[a]	-1.547095
KNOW	-.4681676[c]	-4.823695
VOCTRG	-.9643820-01	-.4471593
FED	-.4664332[b]	-1.990281
FRIEND	1.267928[c]	5.991053
NOFULLJ	-.7949425[c]	-7.033152
NOPARTJ	-.2504431-01	-.2045643
GRINC	-.1168442[b]	-2.155557
NOJBPL	-.4993377[c]	-4.621451
EMPL	-.6157772[c]	-2.624879
TYPE	.9607698-01	.2966455
RTE	1.932285[c]	7.576201

$\chi^2 = 35.09$[c]

[a] Significant @ the .1 level

[b] Significant @ the .05 level

[c] Significant @ the .01 level

Table 20 Model XI Union Training Program 1973-75

DEPENDENT VARIABLE	ONBBIN	NO. OF OBSERVATIONS 92
VARIABLES	ESTIMATE	T-STATISTIC
CONSTANT	-1.620828	-1.626378
AGE	.1189715-01	.6590314
MIL	-.7221383[c]	-3.417790
MAR 1	-.4526373[b]	-1.698842
MAR 2	-.3146988	-1.045416
HEAD	-.1983648	-.7808432
DEPS	.3949406-01	.6125874
WELF	-.6847112[c]	-3.085161
GRADE	.2681992[c]	4.239016
KNOW	.7539563[c]	7.281732
VOCTRG	-.2292323	-1.094106
FED	-.4802752[b]	-2.081581
FRIEND	-.4881134[b]	-2.305388
NOFULLJ	-.2182461[b]	-2.228352
NOPARTJ	-.3758000[c]	-2.807990
GRINC	-.4906045-01	-1.108375
NOJBPL	-.2637583[b]	-2.211628
EMPL	-.7835281-01	-.3552862
TYPE	-.4031516[a]	-1.583254
RTE	.6758543[c]	2.445785

χ^2=20.56

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

Table 21 Model XII Union Training Program - PAP Training 1971-72

DEPENDENT VARIABLE	ONBBIN	NO. OF OBSERVATIONS 103
VARIABLE	ESTIMATE	T-STATISTIC
CONSTANT	3.284793	2.168497
AGE	-.1006850[c]	-2.996920
MIL	-.7034713[c]	-4.320223
MAR 1	.7636853[c]	3.257826
MAR 2	3.539375[c]	7.998078
PWAG	.4907647[b]	1.808696
HEAD	-.6398918[b]	-2.313946
DEPS	-.2337883[c]	-2.538107
WELF	-.5290605[c]	-3.671291
GRADE	-.3589709-01	-.3251990
PRJT	.6317175[c]	2.983235
FED	-.7950850[c]	-3.836282
LCONUN	-.6287840[b]	-2.064368
LCONSK	-2.94752[c]	-5/-83650
LGENUN	-.5094319[c]	-2.710927
LGENSK	-2.620051	-6.396556
LWHITE	-1.274028[c]	-5.397884
GAIN	.3932992[c]	4.177820
LINC	.5994037-05	.1341970
LUN	-.2341152-02	-.6396040

χ^2=21.15

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

Table 22 Model XIII Union Training Program - PAP Training 1973-75

DEPENDENT VARIABLE	ONIBBIN	NO. OF OBSERVATIONS 90
VARIABLE	ESTIMATE	T-STATISTIC
CONSTANT	.3318603	.2596487
AGE	;3677728-01	1.182162
MIL	.3503516[b]	1.895325
MAR 1	-1.405847[c]	-5.994662
MAR 2	-.8883836[c]	-2.410704
PWAG	-.5667203[c]	-2.831241
HEAD	-.7226724[c]	-3.420144
DEPS	.3234984[c]	3.601218
WELF	-.3239727[b]	-2.335932
GRADE	.8858262-03	.1098770-01
PRJT	-.6083383[c]	-3.247700
FED	.2493839[a]	1.640845
LCONUN	-.7635961[c]	-2.634712
LCONSK	-1.433575[c]	-3.895059
LGENUN	-.9127094[c]	-4.171677
LGENSK	.2496512	.6968992
LWHITE	-.3459491	-1.262942
GAIN	.5375854[c]	5.260213
LINC	.2833902-03[c]	6.779679
LUN	-.7609717-03	-.1878698

χ^2=15.62

[a]Significant @ the .1 level

[b]Significant @ the .05 level

[c]Significant @ the .01 level

of this change.

Models XII and XIII are both derived from MA-101 and MA-102 data concerning 197 individuals for whom we were able to find failure data. By definition this set is composed of PAP placements. Thus, success (or the dependent variable) was defined as not having been terminated given that the individual was a PAP trainee. Both models are insignificant. Model XII for 1971-72 placements indicates that variables AGE, MIL, HEAD, DEPS, WELF, FED, LCONUN, LCONSK, LGENUN, LGENSK and LWHITE are all significantly negative. MAR 1, MAR 2, PWAG, PRJT and GAIN are the only positive and significant variables. Note that over 50% of this group had, by December 1975, been terminated. This, in part, could explain the predominance of negative variables. Model XIII for 1973-75 placements has variables MAR 1, MAR 2, PWAG, HEAD, WELF, PRJT, LCONUN, LCONSK and LGENUN negatively affecting success. Influencing success positively are variables MIL, DEPS, FED, GAIN and LINC. Clearly, virtually all significant variables in these two models conflict in the direction of their effects on success probabilities. Within the context of the overall lack of significance of these models, the results lend a little credence to the hypothesis that there was a change in the Pittsburgh Plan (or the unions) between 1972 and 1973. In the absence of any other data, it would perhaps be wisest not to attach much weight to these findings. The small samples and the grossly disproportionate number of failures in sub-categories (for example the predominance of OJT terminations in the 73-75 group) indicate the need for caution. Perhaps the only conclusion that can be reached is that in the absence of either more (or better) data, or outside information, this analysis is but one small step in understanding the characteristics that govern or aid in the process of termination in construction unions.

SUMMARY

Due to the program structure of the Plan six definitions of success were formulated. Due to data restrictions three were definitively analysed and two were explored. The latter because of both lack of data as well as technical infeasibility (i.e. the Plan has not existed long enough to allow enough individuals to receive their books).

Using these analyses, the successful persons in the PAP were the older, better educated, with higher earnings prior to entry. Further those with financial responsibilities and/or unfortunate marital histories tend not to succeed and finally, those with better job opportunities in the general market

tend to leave before successful completion. While the success rates in the three organizations are different, there is no bases for asserting that they function differently and the observed differences rates could well be accounted for by the differences in the input populations. Note that absenteeism is, as expected, a significant determinant of success.

From the perpective of union placements, the PAP trainee most likely to be placed is indeed the type unions state that they favor. He is the older, better educated, with higher income, military experience and with family if not financial responsibilities. On the other hand, it appears that those capable of finding jobs outside construction are not as successful. It is hypothesized that this may be due to the waiting times involved in union testing and placement; thus reflecting less a negative characteristic as much as a self-screening process. Both absenteeism and success in the PAP program appear to be very good indicators for placement (negative and positive respectively) and as above, there are no substantive differences between the three training organizations. Further, it appears that once the PAP trainee leaves without being placed, there is very little chance that he will ever re-enter the system. Finally, we note that but for the responsibility type variables, there are no contradictions between the two success profiles.

Though the remaining models are not adequate to determine success profiles they indicate that there was some, currently unknown, change in the Plan in 1972-73. Further, there appears to be little doubt that the PAP placement is less successful at staying in the union training program than the direct placement.

Clearly additional data are required to accurately model success at all these higher levels. It is hoped that such data will also reveal the change hypothesized in the Plan, and, since the 1973-75 placement appears to be less prone to terminate, result in better recruitment policies.

CHAPTER 5

FAILURE ANALYSIS

To a large degree most of the Pittsburgh Plan's activities are centered around placement into a union training program. There is some effort made to follow up on those placed and via the field supervisor program some attempt is made at crisis management. However, the placements have had a high rate of failure and since the journeyman's book is the ultimate goal of the program a detailed analysis of failure after placement was deemed useful.

The three-five year span required to qualify for a book implies that only the 1971 cohort of placements could be tracked through the entire period with all the rest having progressively less time either to terminate or to get a journeyman's book. The more practical implication is quite simply that overall percentages of termination cannot be taken to indicate the probability of termination. For example, the overall percentage of failure in the PAP placements (i.e., placements who were trainees in the PAP program) is 31%. However, if we track the 71 and 72 cohorts alone we observe that over 50% of these placements have been terminated. Further, the number of journeyman's books conferred is very few in number and the books appear to have been very haphazardly awarded. To illustrate, of all journeymen, over 30% received their books within the first two years of their stay in the training program. Considering that the minimum stay required by any union training program is three years, it is clear that many other factors are taken into consideration when awarding a book. The combination of the above two points with the fact that we have very little data on the characteristics of those who get their books virtually demands that we make a detailed investigation of failure processes rather than analyze the successful individuals. Naturally, the implicit assumption we are making is that those who are not terminated will eventually get their books. As will be seen later this is not a very impractical assumption.

The data used are the dates of placement[1] and dates of termination (if the individual was indeed terminated) gathered from the records maintained by the Pittsburgh Plan Co-ordinator's office. After eliminating all those observations with missing dates and eliminating those who had left the training program to enter the armed services, the dataset consisted of 763 observations. Note that all these observations were on individuals placed before December 31, 1975. Also, persons who were terminated in 1976 were considered to be onboard for our analysis. Similarly those who received their books in 1976 were not treated as journeymen and journeymen who quit (roughly 2 persons) were treated as journeymen.

There are many levels of detail that would ideally be investigated in any analysis of failure. To begin with, one would attempt to keep various cohorts separate. Within each cohort one would like to have maintained each union separate and within each union each training type and placement type separate. One might even have wished to keep the three organization types separate. Clearly, the very few numbers of individuals in each of these possible 1764 distinct categories negated such a detailed analyses. To reduce the categories various tests were performed and groups least different were pooled together. Of these pools further pooling was done on the basis of utility. For example, while it is clear that OJT's and APP's have different failure rates and direct and PAP placements in turn have different failure rates it was thought that the latter (i.e., placement type) differences would be more critical for two reasons: 1) a simple prediction type of analysis indicated that using placement type to predict failure rates in training program type was better than using training type to predict failure rates in placement type; 2) it would seem that for policy analysis the differentiation be made using criteria that are under program control rather than under union control. Clearly the Pittsburgh Plan can decide upon which types to place - PAP's or direct's. On the other hand, the decision of the training

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[1] This date need not necessarily match the date officially recorded as the latter is dependent upon approval or validation by the OFCC.

program type is to a large degree out of the hands of the Plan officials. (The initial differences between an OJT and an APP - that of age has to some degree been changed. A few unions have indeed shifted to a totally OJT type of training program). The bias introduced by failure to distinguish between APP's and OJT's are discussed later.

From the perspective of using the results of these analyses, it was felt that maintaining organizational differentiation would not be worth the loss in accuracy (a result of further sub-dividing the population). In Appendix F the data used for these analyses are described.

Two types of analysis were attempted. The first was to model the failure process by assuming that the failure probabilities followed some probability distribution. Unfortunately, the failure process appears to be far more sophisticated than our models were resulting in a bad 'fit' between data and models. In any event the study of the failures in each time interval yielded some puzzling information. To begin with, Figure 4 is a graph of the number of failures given that the individuals had served for a certain period. (Note: throughout this analysis the time interval considered was one quarter because of the very few numbers of people in each cell if the breakdown was more sensitive.) As can be seen the number of failures follow a very erratic path. Theoretical considerations and some empirical evidence suggests that in the absence of non-random characteristics the number of failure should to a large degree be steadily decreasing as the length of service increases.[1] In this case not only do we not have a monotonic (or steady) decline in the number of failures but we observe that there is a pattern to the erratic behavior.

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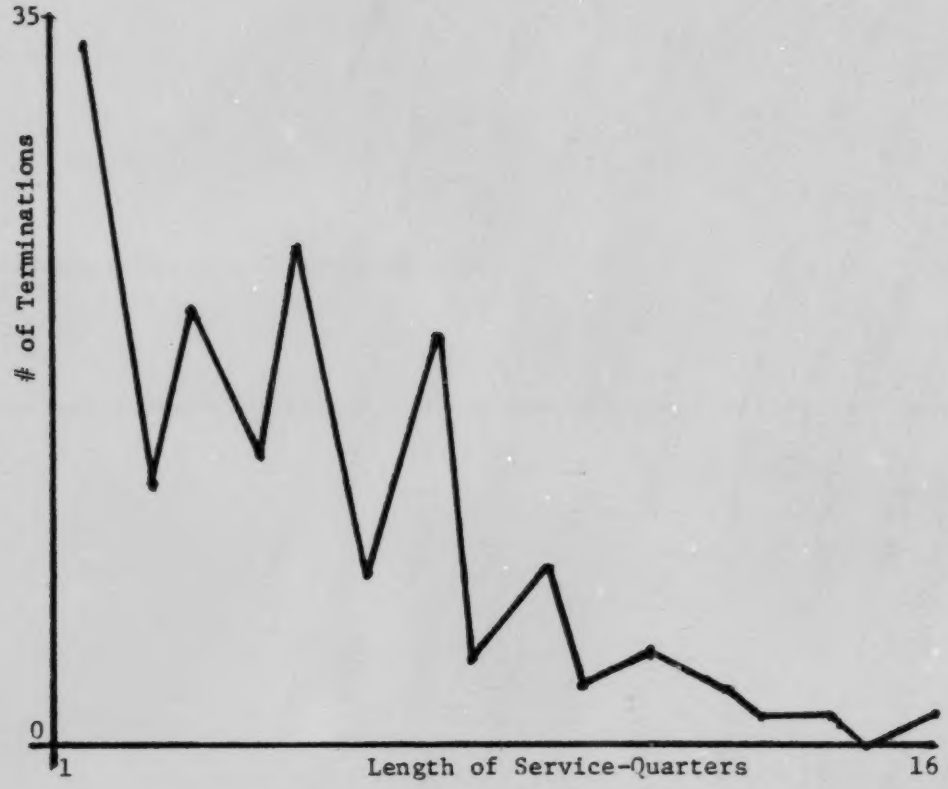
[1] See Perry, Wayne D., "General Quantitative Models and Policy Analysis of Turnover and Attendance in Manpower Programs," Unpublished Ph.D. dissertation (1975) Carnegie-Mellon University.

Figure 4 Graph of Number of Terminations vs Length of Service
All Placements



To test if this was a phenomenon governing only certain categories of people these graphs were drawn for a variety of clusterings and almost all cases exhibit the same phenomenon. (See Appendix F for these figures). As will be seen later, the conditional probabilities of failure (i.e., the probability of failure given that the individual has served for a certain length of time) for different groups also follow a pattern and with the same regularity. These similarities across cohorts, placement types and training types indicate that there is a very definite institutional or environmental force in union programs (or the Pittsburgh Plan) causing maximum failures in the second year as opposed to the first.

Since modelling the failure or termination process using probability distributions was not successful a simple Markov chain model was postulated. The transition states were defined as Year 1, Year 2, Year 3, Year 4, Year 5, J-Man, and Terminated. The fundamental assumptions of a Markov Chain Model are:[1]

1. Path Independence - that is, the state occupied by an individual in time period t is dependent only upon the state occupied in time period t-1.
2. Stationarity - that is, the probability of moving from one state to another is independent of the time at which the transition or movement takes place.
3. Homegeneity - that is, the transition probabilities are independent of the characteristics of the people making these transitions.

By the very definition of these states assumption one is satisfied. As for assumption two, tests indicated that the transition probabilities were not stationary across all years. Further, they showed that these probabilities were stationary within the years 1971 and 1972 and the years 1973-1975.

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[1] See BHAT U.N., Elements of Applied Stochastic Process, (1972), John Wiley and Sons, Inc.

Accordingly, these two groups were analyzed separately. The tests performed and their results are given in Appendix F.

A priori considerations as well as tests on observations indicated that there were many levels of heterogeneity, thus destroying assumption 3. However, due to reasons cited above the data were partitioned only between PAP and direct placements and it was assumed that within the group created by this partitioning, the population was homegeneous. For a discussion of the bias introduced by this assumption see Appendix F.

We have therefore four sets of transition probabilities; one each for the following populations:

1. PAP placements placed between 1971-1972
2. PAP placements placed between 1973 and 1975
3. Direct placements between 1971-1972
4. Direct placements between 1973-1975

It was also assumed that both the journeyman and terminated states were absorbing states, i.e., once an individual enters either state the person cannot leave it. The assumption is not inaccurate since only two journeymen have been recorded as having quit (both apparently having moved out of the area) and only six who either quit or were terminated and went on to join the training program of another union.

By the very nature of states defined, the transition probabilities from Year 3, Year 4, and Year 5 were based on decreasing numbers of people. For example, the 1972 cohort has not had the time to move out of the 5th year and hence the estimate from the 5th year to the 6th, J-man and Terminated states are based only on the 1971 cohort. Nevertheless, the estimates are reasonable for both PAP's and direct's who were placed before 1973. For similar reasons estimates of the 4th and 5th years transition probabilities for the 1973-1975 cohorts were taken to be the same as those for the 1971-1972 cohorts. Since estimates of the probability of failure are consistently higher for the pre-72 group as compared to the 1973-1975 group this estimate is definitely conservative for direct placements. However for the PAP placements, the additional assumption about the failure probabilities being

equal to 0 after the fifth year might compensate for the negative bias introduced by the above assumption.

Using the transition probability matrices shown in Tables 8-11 in Appendix F it is a relatively simple matter to estimate the overall probability that an individual placed according to any of the above four categories will terminate, up to and including the year of interest. Similar probabilities of termination for each of the four populations were:

	3 Year	4 Year	5 Year
PAP (pre-73)	.423	.435	.539
PAP (73-75)	.264	.357	.413
DIRECT (pre-73)	.271	.293	.293
DIRECT (73-75)	.176	.205	.205

Probabilities of failure for various other clusterings of people are presented in Appendix F. Two things of interest are obvious from the above probabilities. The first is the difference between the pre-72 and 73-75 groups within each placement type. In every case the 1973-75 group is less prone to terminate. We have tried to discover the reasons for this change. Many causes have been suggested but there is little evidence to confirm any one and there are many indications that introduce conflicting causes. The first one concerns the behavior of the unions themselves. We have been told that some unions, especially the larger, more prosperous ones, appear to have become more amenable to the presence of minorities and that perhaps it is this change in attitude that if reflected in the change in the failure probabilities.[1] A second

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[1] Interview with Mr. Garfield Gardner of the Pennsylvania Bureau of Employment Security.

explanation offered is that the change occurred due to the presence of the field supervisor program which officially began in the beginning of 1972 but started in full earnest sometime in the beginning of 1973. (See Chapter 3 for a description of this program.) However there is a little evidence that both of these explanations are inadequate. If one traces the third year failure rates of the 1971 and 1972 cohorts and compares them to the failure rates for the 1973 cohort, one observes that the difference between the 1971 and 1972 cohorts is minimal compared to the difference between them and the 1973 cohort. In other words during the period after 1973, the 1971 and 1972 cohorts were still more prone to failure (given equal length of stay) than the 1973 cohort. The third year conditional probabilities of failure for the three cohorts are: .143, .121, and .069 respectively. However chronologically, 1971 cohort would have been in its third year in 1973, the 1972 one in 1974 and the 1973 one in 1975. If either or both of the above explanations were adequate one would expect the three probabilities to be the same. ($\pm$ the standard deviation. See Appendix F.)

Yet another hypothesis is that the selection and processing guidelines and procedures for the Pittsburgh Plan had changed dramatically between 1972 and 1973. This hypothesis would account for the difference in the termination probabilities by the differences in the input population. Analysis of success profiles tends to show that there was some change in this period. An individual prone to failure in the 1971-1972 group appears to be the more successful type in the 1973-1975 group. (See Chapter 4.) Such a pattern appears to hold for all placements taken together and PAP placements alone. Also the average individual in the samples does not differ much between the two groups. The overall indication is that there is almost a different process in the Pittsburgh Plan after 1973. However, discussions with Plan management have not shown any such deliberate policy changes.

It is clear that a great deal of work has to be done with these failure data. The erratic behavior of the number of failures given the length of service and the consistent finding that the second year conditional probability of termination is the highest need to be investigated as to their causes. Further, if the differences in termination probabilities between the 1971-1972

and 1973-1975 groups are due to different input populations these differences should be investigated and appropriate recruiting and selection policies formulated. For the present, however, the two major findings of this analysis are that the PAP and the direct placements are significantly different in their probabilities of termination and that the most critical time in the training period for any trainee is the second year. Both of these findings have policy implications which will be explored in later sections.

SUMMARY

Due to the age structure of the Plan population and due to the varying length of services required by various unions the gross probability (percentage) of termination is misleading. Taking this into account along with the differences between PAP and Direct Placements and the 71-72 and 73-74-75 cohorts, the estimated probabilities of terminations within a 5 year length of service are:

PAP 71-72	.539
PAP 73-75	.413
DIR. 71-72	.293
DIR. 73-75	.205

In addition this analysis indicates that there was some change, so far unaccountable, in 72-73 which lead to the differences in failure probability. Further, the patterns of failures across time while steady across various sub groupings in the Plan, are not in keeping with theoretical expectations. Finally, the most critical period for termination is the period year in the union training program when the condition probability of terminations is the highest. These three points need further investigation.

CHAPTER 6

BENEFIT-COST ANALYSIS

The benefit-cost analysis is concerned with providing an economic measure of the performance of the total Pittsburgh Plan program not being limited to the training activities of the pre-apprentice training organizations. This is necessary and appropriate as the benefits of increased employment and wage level is the result of the combined activities carried out by the various components of the Plan.

DATA SOURCES

There are two primary sources of individual participants data for the analysis. The first is the records maintained by the Plan management. This includes statistical summaries of Plan participation and individual information from DOL forms MA-101 and MA-102 for each participant.[1] This data provides information about participants prior to, during and immediately upon termination from the training portion of the Plan. To gain information about participant experience following termination, the Research Team developed and administered questionnaires to a sample of former trainees, which constitutes the second major data source. More detailed information concerning this survey is contained in Appendix B.

Data based on records for the full set of participants is used whenever available; when this is not possible, results of the sample survey are extrapolated to the entire participant population.

Data used to estimate some of the costs of the Plan were gleaned from extensive budgetary information made available by the Pittsburgh Plan Coordinator's Office.

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[1] See Appendix A for discussion of these data.

THE BENEFIT-COST ANALYSIS FROM THE SOCIETAL PERSPECTIVE

This viewpoint, that of society as a whole, is the one most commonly adopted when using benefit-cost techniques for evaluative and funding decision purposes. The analysis purports to capture all of the important costs and associated benefits related to the usage of society's resources by the funded program, and so addresses the question "Is society well served by investing in this program?".

The benefits are primarily the expected increased lifetime earnings (assumed to occur over a 30 year period) of Plan participants due to their experience in the Plan. In addition, these increased incomes allow workers formerly dependent on welfare payments to become financially self-sufficient, with a corresponding benefit of increased stature and more complete participation in society.

The costs considered include the budgeted value of staff wages and other costs of operating the program plus the opportunity cost of the trainees' time (foregone earnings) for those pre-apprentice trainees enrolled in the training program.

The analysis presents these costs and benefits and then compares them by discounting the expected benefits of increased earnings to give a present value comparison.

DETERMINING THE BENEFITS TO INDIVIDUALS OF BUILDING TRADES EMPLOYMENT

Benefit-cost studies traditionally accept as the most appropriate purpose of governmental enterprise the most efficient allocation of resources to benefit society as a whole. Distributional consequences of government programs are displayed and explained but the primary concern of the analysis is not the distributional aspects.

This approach is clearly inappropriate when the very motive of a program is to redistribute wealth, either directly or by redistributing employment opportunities as does the Pittsburgh Plan. An analysis based on strict allocative efficiency criteria requires that rather heroic assumptions be

made in order to consider the full increase in earnings to be counted as benefits. (For a discussion of these caveats see Appendix E.) Yet maximizing these benefits of increased earnings to individuals may be an appropriate program goal. For this reason the benefit-cost effort, while estimating the societal benefits and costs independent of a preference for providing increased income to minorities, places much greater emphasis on the use of benefit-cost techniques to analyze alternative program structures and processes from the perspective of maximizing the benefits to the persons that the program serves.

BENEFITS OF THE PITTSBURGH PLAN

Increased Lifetime Earnings

The primary benefit to be attributed to the operation of the Pittsburgh Plan is the expected increase in lifetime earnings resulting from building trade union membership (as a measure of increased productivity). In order to calculate these benefits the expected earnings of non-participating but otherwise similar minority group individuals is compared to the expected earnings of program participants, as in Figure 5. The shaded area between the two curves represents the benefits to be attributed to participation in the Plan. Benefits of increased earnings due to placement in jobs other than the building trades may be represented in exactly the same fashion.

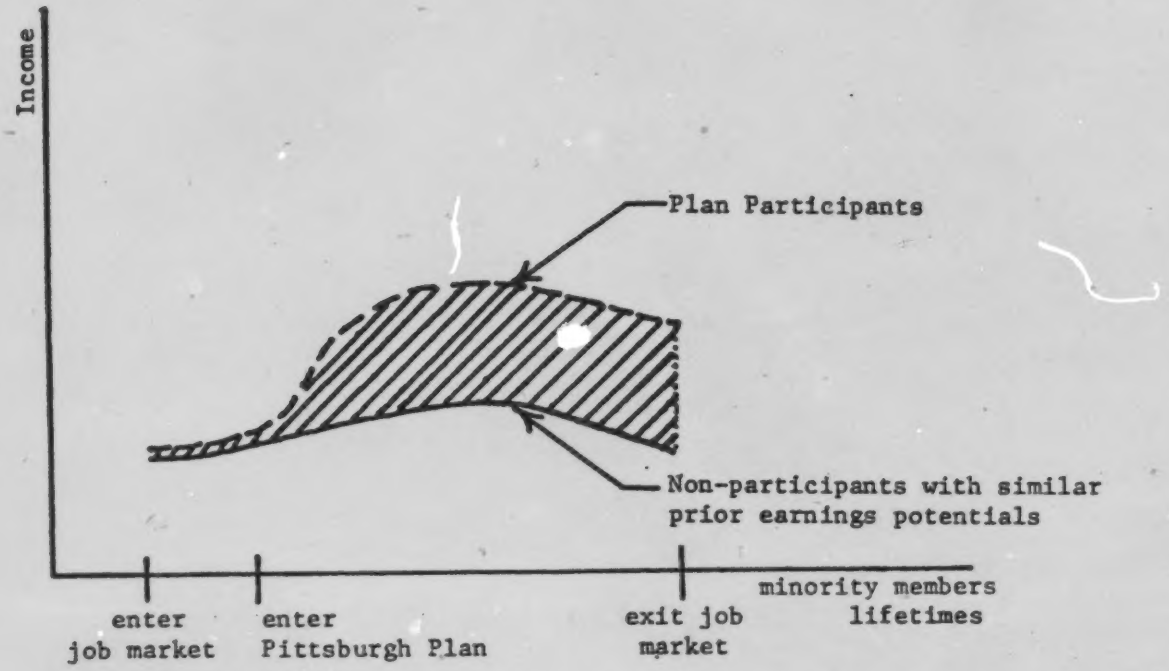


Figure 5 Benefits Due to Increased Lifetime Earnings of Participants

In order to determine the total benefits to be attributed to the Pittsburgh Plan the following estimates are developed and discussed in the course of the analysis:

(1) the expected lifetime earnings of minority members who are or were potential participants in the Plan

(2) the expected lifetime earnings of participants (broken down by the following sub-populations)

   a. those who have achieved journeyman status

   b. those in union though not journeymen

      1. those expected to achieve journeyman status

      2. those expected to quit or be terminated before becoming journeymen

   c. those who were placed in a union but subsequently have quit or been terminated.

   d. those who successfully completed the pre-apprentice program but were not placed in a union

   e. those who did not complete the pre-apprentice program.

The need to identify these various sub-populations of Plan participants and separately calculate the benefits for each group may be clarified by examining the possible paths of participants as they pass through the Pittsburgh Plan/building trade union system.

From the perspective of the individual the benefits of participation can be viewed generally as follows:

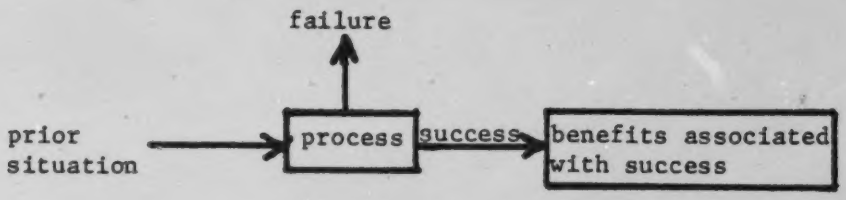
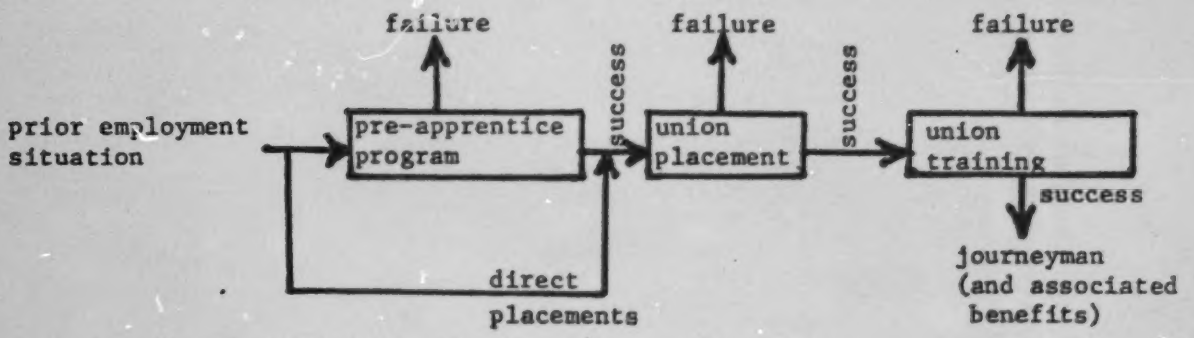


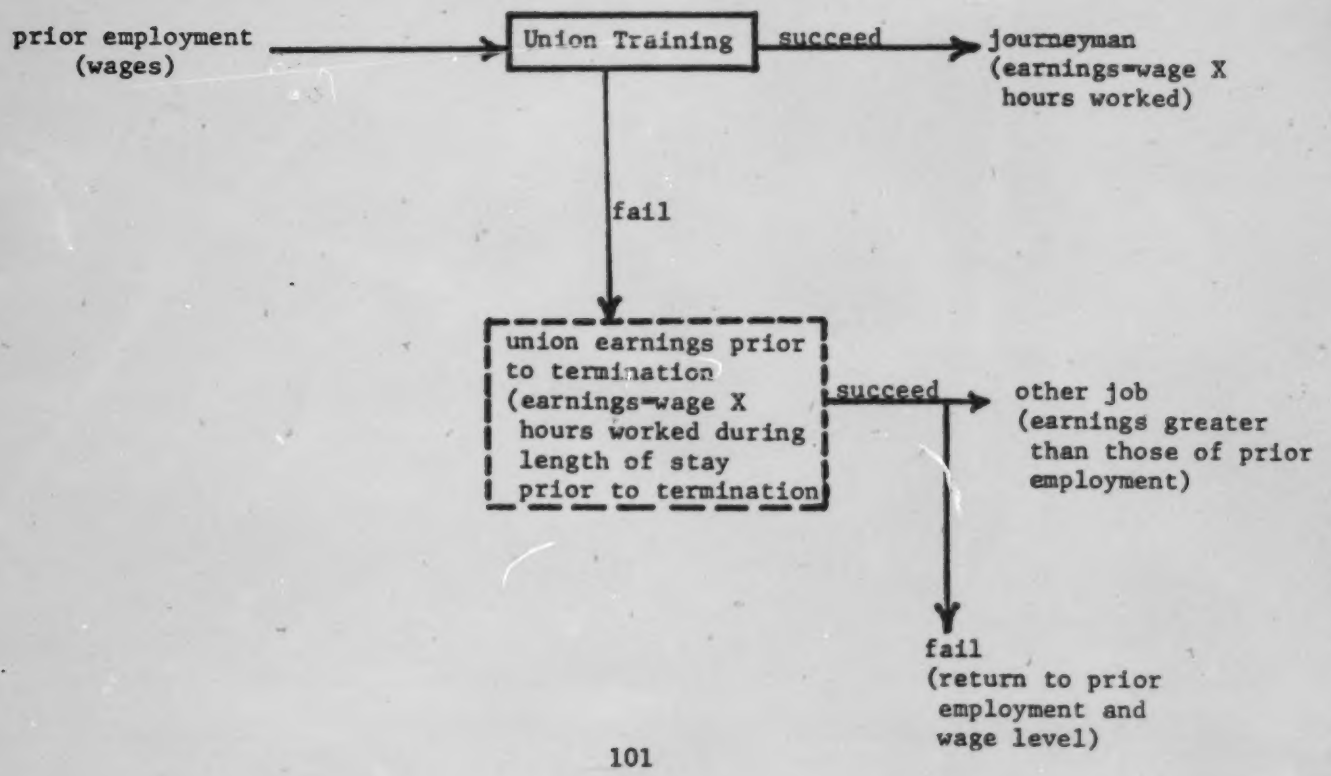
Figure 6 Modified Pittsburgh Plan Participant Flow



Benefits from Union Employment - Increased Earnings

Having conceptually accepted the increase in wages from prior employment to building trades employment as program benefits the estimation of the level of these benefits is important. (See Appendix E for assumptions implicit in counting increased earnings as benefits.) The calculation of benefits of increased earnings requires the process illustrated in Figure 6 (that portion following successful union placement) to be modeled. More completely the following situation must be characterized.

Figure 7 Detailed Flow of Trainees Following Placement in Union


prior employment (wages)
Union Training
succeed
journeyman (earnings=wage X hours worked)
fail
union earnings prior to termination (earnings=wage X hours worked during length of stay prior to termination
succeed
other job (earnings greater than those of prior employment)
fail (return to prior employment and wage level)

Using the conceptualization of Figure 7 the benefits of increased earnings to each individual are calculated with the following model.

Benefits = expected union earnings + expected earnings in other jobs
- non-participants earnings

Union earnings = journeymen earnings + earnings for those who terminate

Earnings for those terminating = earnings while in union training
+ earnings from other jobs

Journeyman earnings = PROB x EARN x WORK x DISCOUNT where:

PROB is (1-probability of terminating from union training during the first five years after placement)[1], i.e., the probability of receiving journeyman's book

EARN is an estimate of the average yearly earnings of journeymen for "full employment" weighted by number placed in each union

WORK is an estimate of the proportion of "full employment" time per year that those in the crafts will work over the projected working lifetime of thirty years[2]

DISCOUNT is a factor which converts the stream of earnings to a present value estimate

Earnings for those terminating = [(1 - PROB) x TERMEARN x WORK x DISCOUNT] + [(1 - PROB) x PROB2 x EARN2 x DISCOUNT] + [(1 - PROB) x (1 - PROB2) x PRIOR x DISCOUNT]

where:

TERMEARN is an estimate of the average earnings for the first 17 months stay in the union training programs weighted by the number placed in each union [3]

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[1] See Chapter 5 for a thorough discussion of this concept and the derivation of estimates used.

[2] "Full employment" accounts for the seasonality of work in specific trades in the Pittsburgh area.

[3] The average length of stay is estimated to be approximately 17 months for those who terminate from union training.

EARN2 is the average yearly earnings in other jobs obtained following union training (if greater than prior earnings)

PROB2 is an estimate of the proportion of persons who, after terminating from union training, obtain other employment due to participation in the Pittsburgh Plan

PRIOR is the median annual earnings of successfully placed participants in the year prior to their entry into the Pittsburgh Plan process

Non-participant earnings = PRIOR x DISCOUNT

This benefits model can provide insight both into the benefits accruing to the individual and into the policy decisions necessary for the operation of a program such as the Pittsburgh Plan. Following is a discussion of the results obtained for the benefits at both the program level and the individual participant level. The estimates of the parameters used and their source is included in Appendix E for each analysis performed.

Calculation of the total benefits to union placements for the years 1971-1975 was performed using the best estimates of the various parameters.[1] The additional information used in the calculation of program benefits is the number of placements for each of four categories:

pre-apprentice placements prior to 1973	113
pre-apprentice placements 1973-1975	140
direct placements prior to 1973	223
direct placements 1973-1975	332

This breakdown of placements was used because of the significant difference in probability of termination from union training estimated for the four groups and the great sensitivity of the benefits calculation to this probability.

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[1] See Appendix E for details of these estimates.

The present value of the total union earnings benefits so calculated is approximately $52.1 million. This total can be viewed as a best estimate of benefits subject to the various assumptions employed.

Sensitivity Analysis

In order to test the sensitivity of this estimate to the implicit assumptions in parameter estimates, each parameter of interest is varied across a wide range while holding all other parameters constant at the best estimate values and the resulting benefits calculated. The results are displayed in the following graphs.

The sensitivity analysis shows that the earnings benefits estimate is not highly sensitive to any of the assumptions of parameter values when these values are held within reasonable bounds. This increases the confidence in the benefits calculations. An interpretive discussion of the sensitivity analysis immediately follows.

A fundamental question for the manpower projects manager is the following: "To what extent does the attractiveness (value) of the building trades as a potentially high-paying employment source decline as the construction industry is hit by major slowdowns and resulting major decreases in hours per year worked by craftsmen?". The sensitivity analysis indicates that benefits of increased earnings (with building trades placements as the primary focus) are greater than the total program cost (including trainee opportunity costs) until the average percentage of "full employment" hours worked by union placements falls below 30%.[1] (See Figure 8.) Placement in the building trades (assuming the observed rate of terminations) therefore appears to represent a relatively good investment of manpower funds even if the construction industry is projected to be in a serious slump.

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[1] Note that the benefits calculations assumes that those in the union earn nothing when not employed in their union jobs making this a conservative statement.

Figure 8 Parametric Variation of % of Full Employment Hours Worked

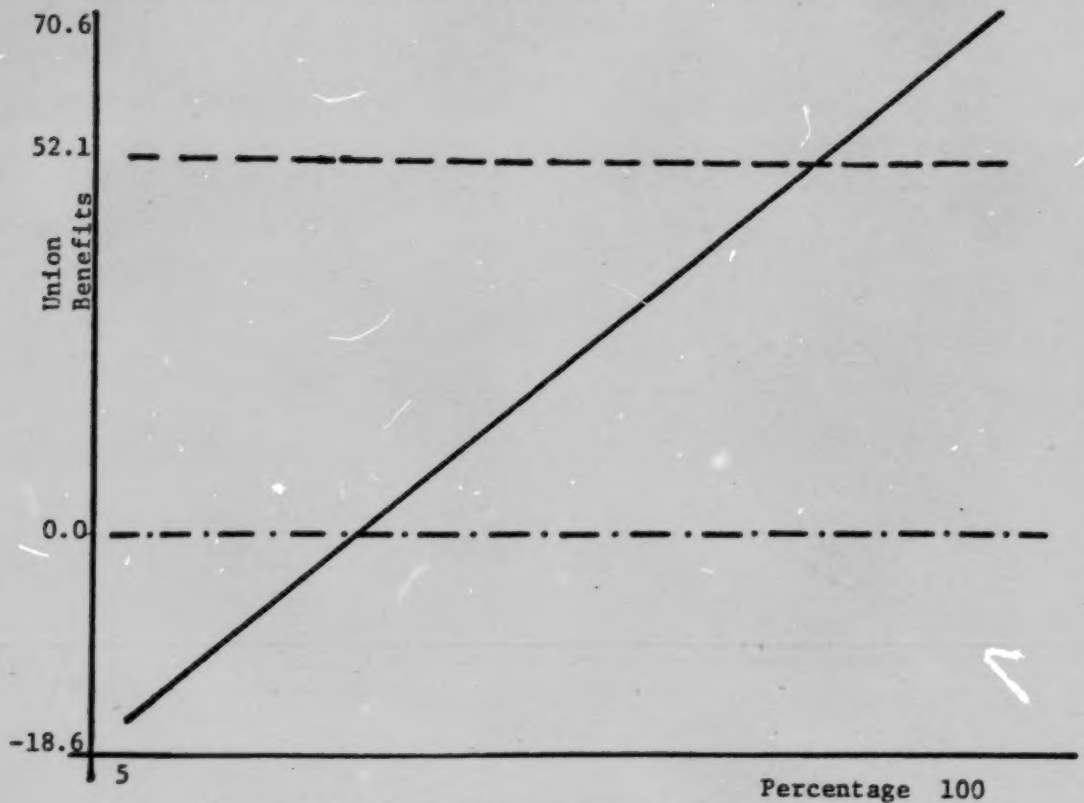


Figure 9 Parametric Variation of Prior Earnings of Placements

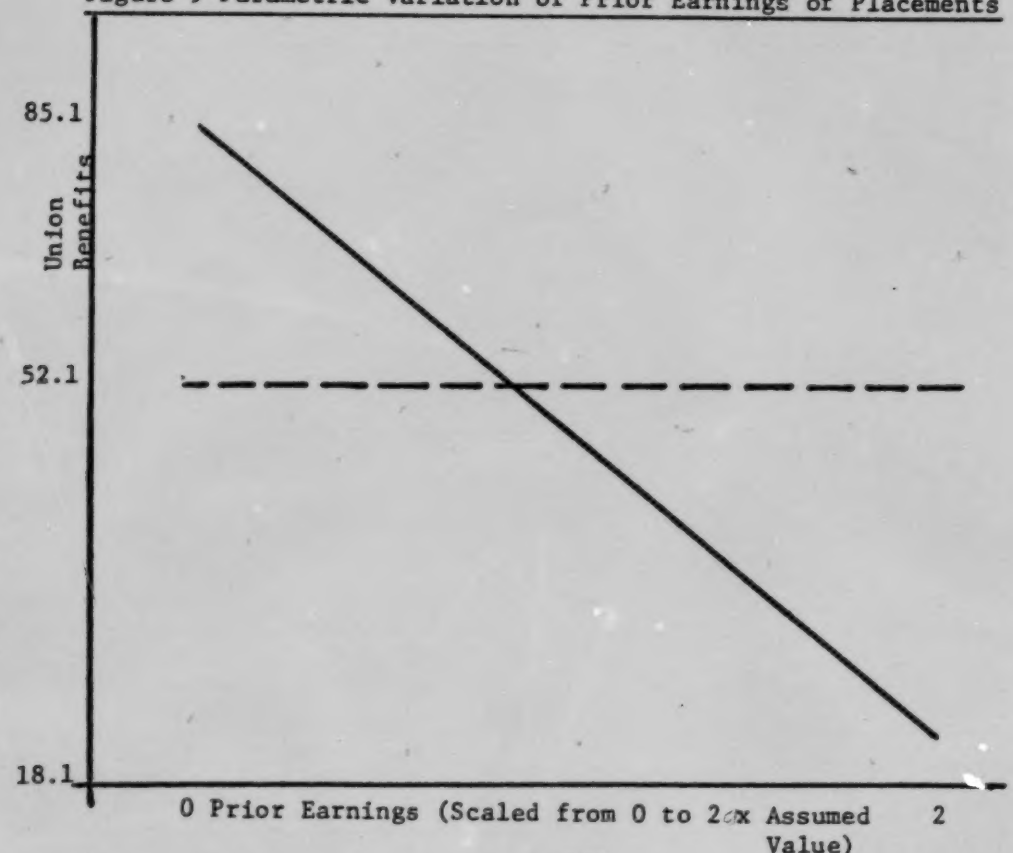


Figure 10 Parametric Variation of Probability of Termination for PAP Placements 1971-72

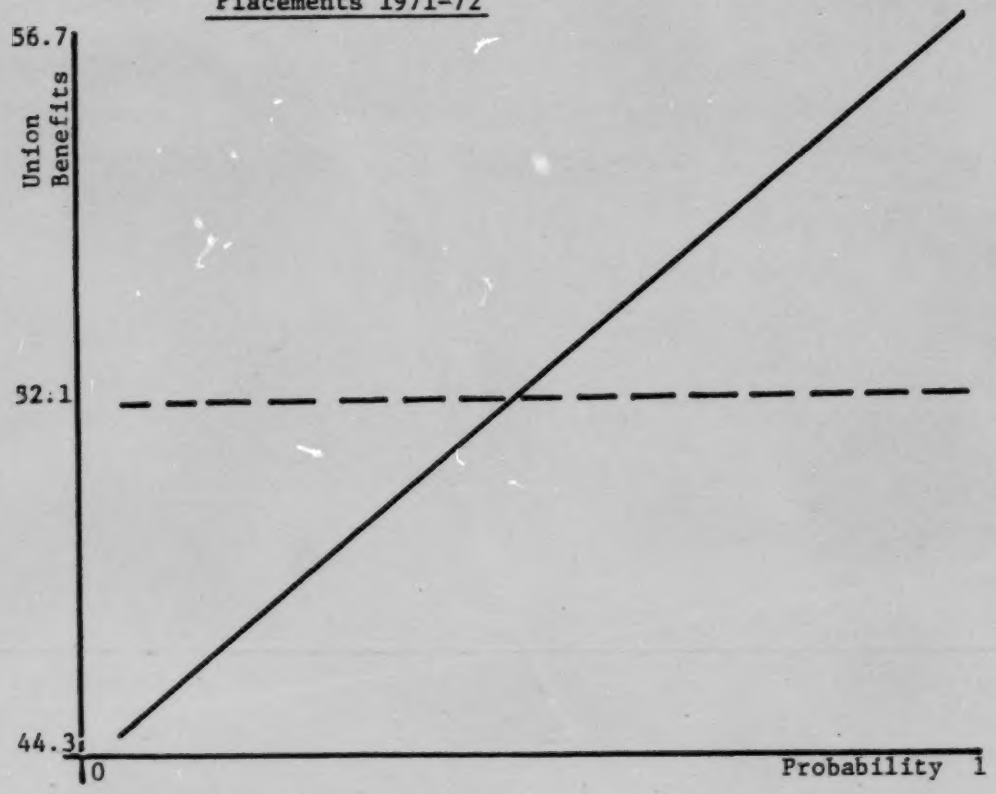


Figure 11 Parametric Variation of Probability of Termination for PAP Placements 1973-75

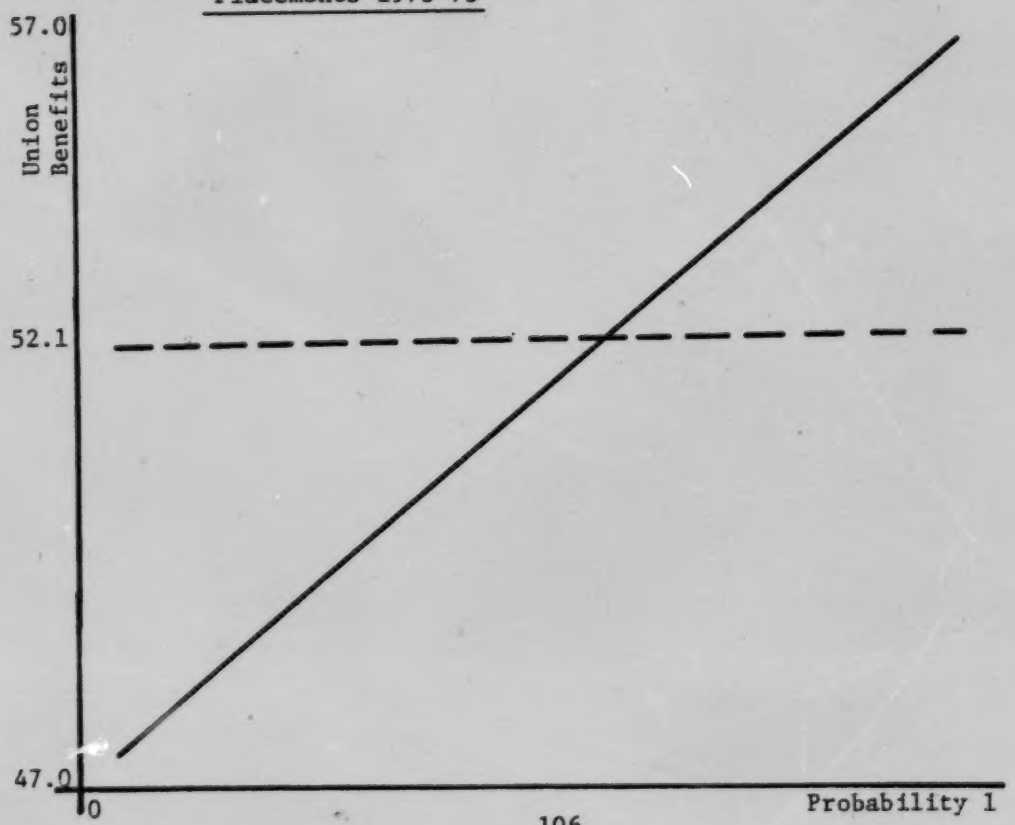


Figure 12 Parametric Variation of Probability of Termination for Direct Placements 1971-72

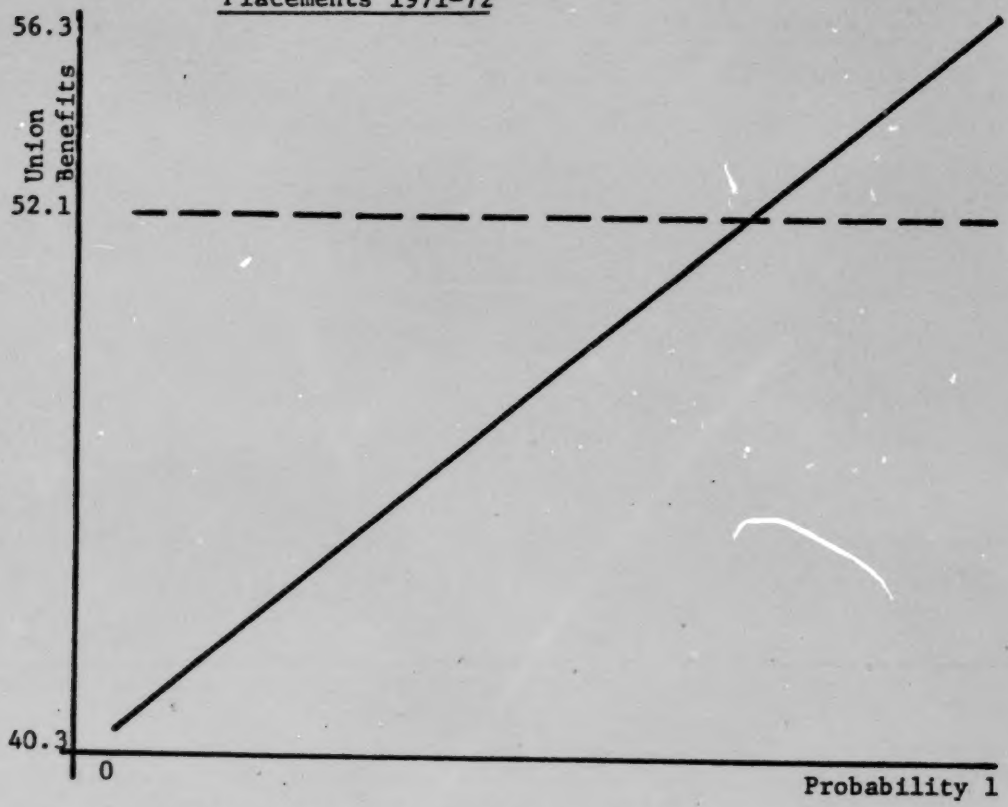


Figure 13 Parametric Variation of Probability of Termination for Direct Placements 1973-75

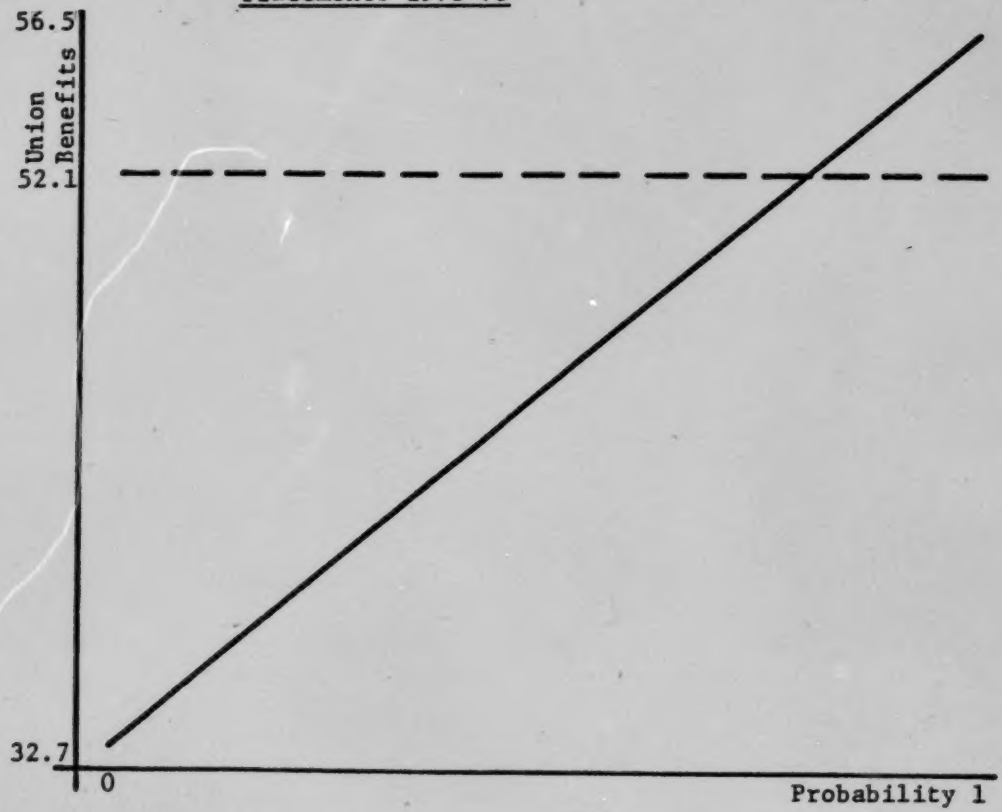


Figure 14 Parametric Variation of the Number of Years of Employment Affected

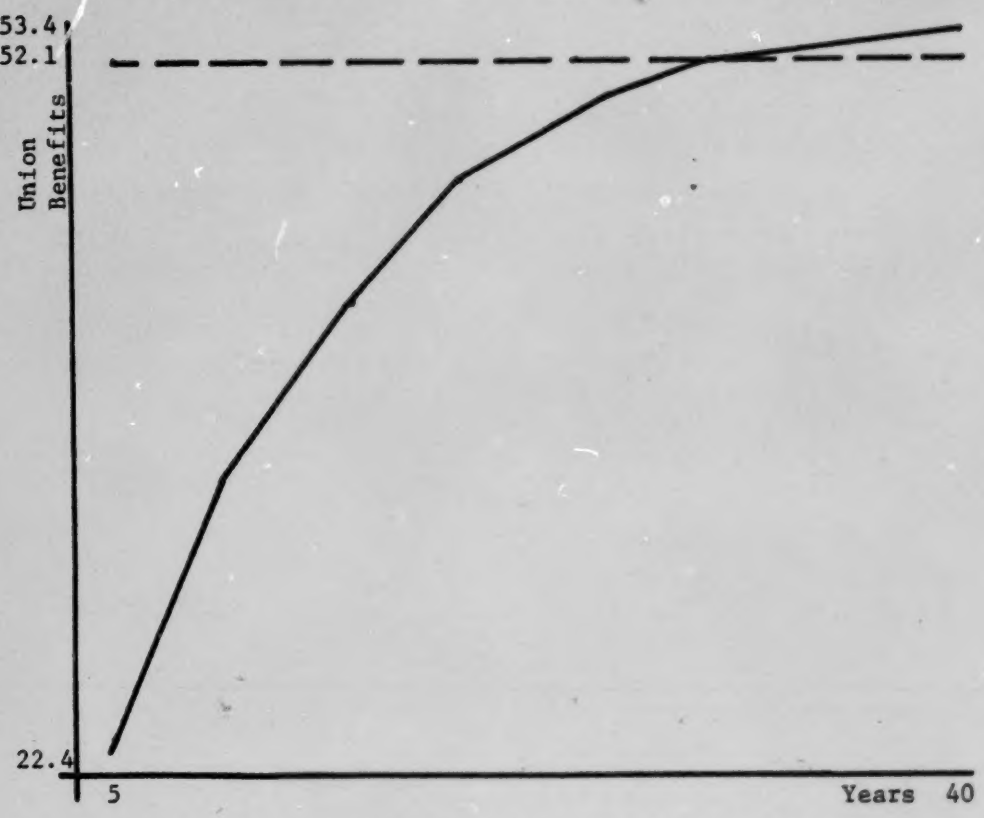


Figure 15 Parametric Variation of Earnings in Other Jobs Following Union Termination

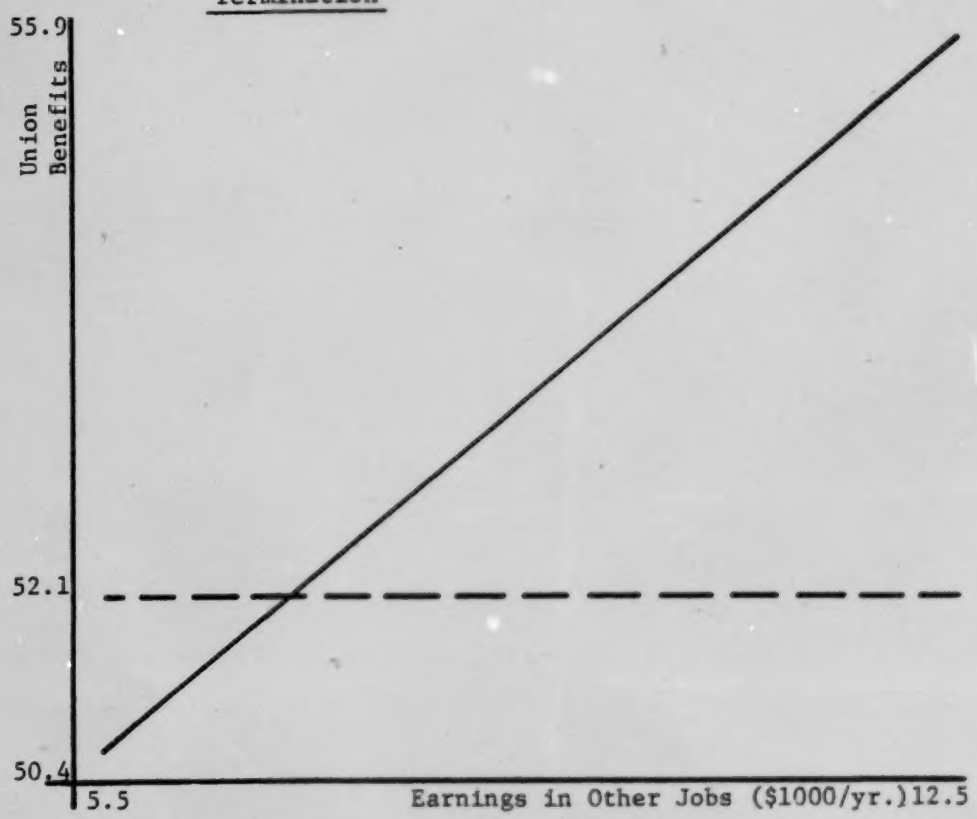


Figure 16 Parametric Variation of the Probability of Obtaining "Other Job" After Union Termination

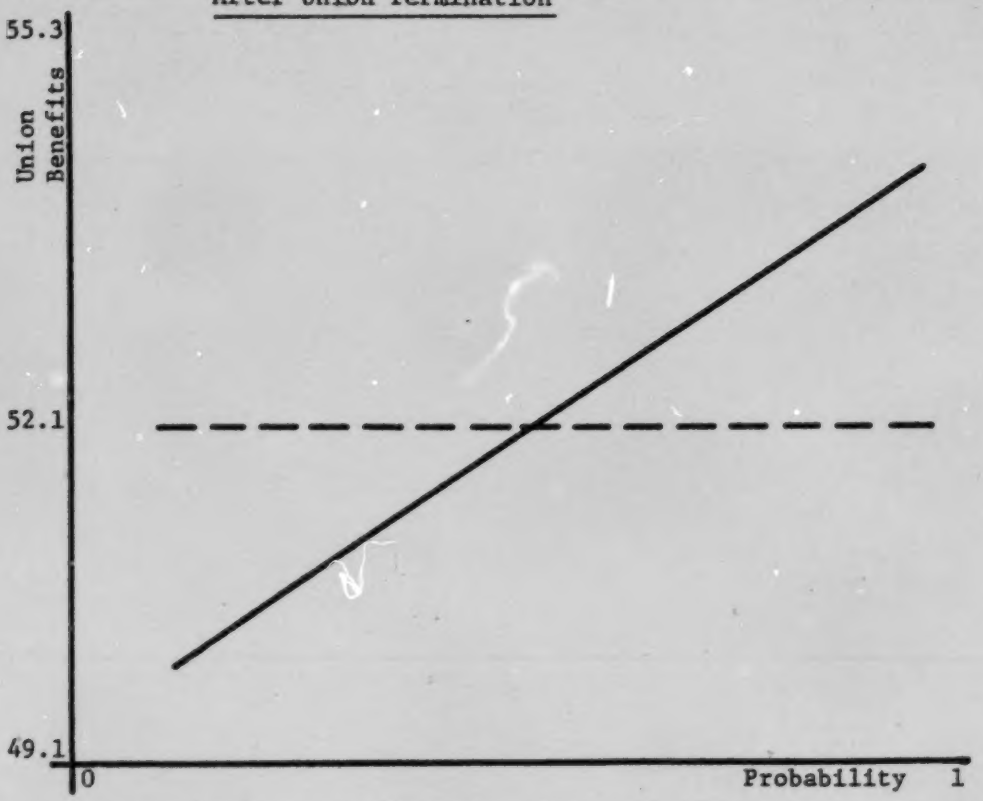
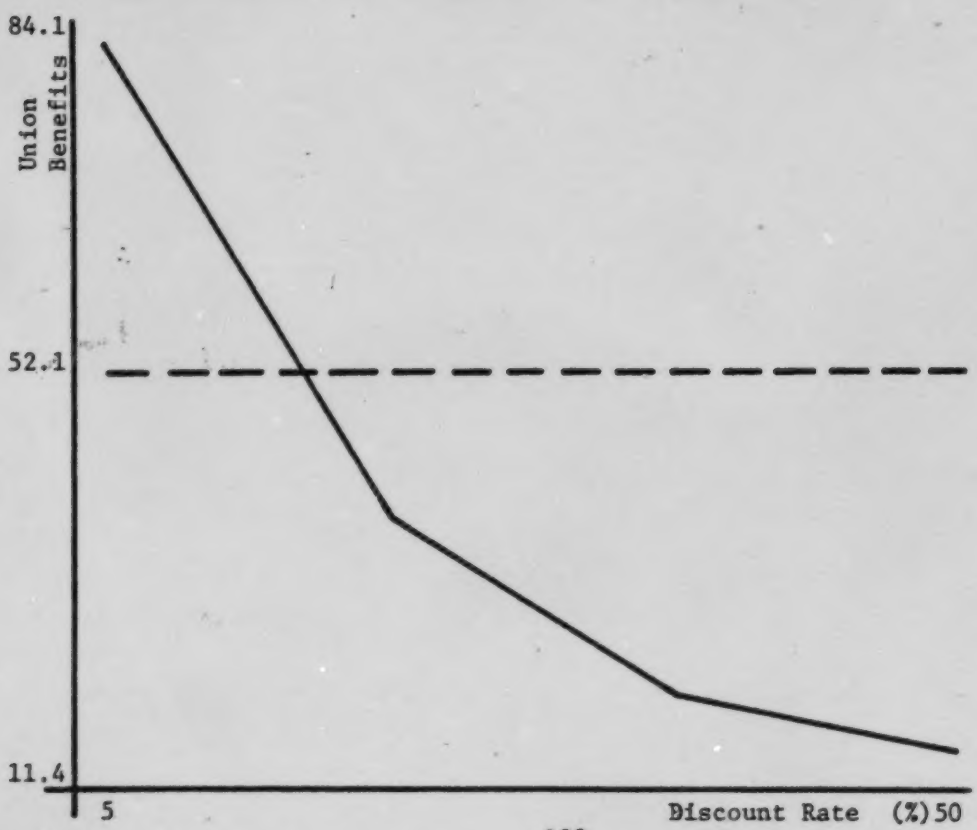


Figure 17 Parametric Variation of the Discount Rate



The benefits are also shown to be substantial even if the prior earnings of the placements is well in excess of those of Pittsburgh Plan trainees. With the estimate of prior earnings (assumed to continue in the absence of the program) doubled from $1,970 to $3,950 for PAP placements and from $5,500 to $11,000 for direct placements, the benefits resulting from union placements alone is $18 million compared to cost of approximately $4.2 million. (See Figure 9.)

The analysis indicates that the proportion of people placed who remain in training to reach journeyman status (here surrogated by proportion not terminating during the first five years of union training) is the most critical parameter. While the termination rate of only one of each of the four placement groups is varied at any point in the analysis, (see Figures 10 through 13) it is clear that if all trainees have a very low rate of success in union training, a program similar to the Pittsburgh Plan could conceivably fail to be a good investment of manpower resources. As discussed in Chapter 5, the estimates used here are expected to be fairly good ones.

Variation of the other parameters examined; discount rate (see Figure 17), number of years of employment to be affected (see Figure 14), proportion of those terminating who obtain other jobs due to Plan participation (see Figure 16), and level of earnings in these other jobs (see Figure 15), does not significantly affect the calculation of benefits when parameter values are constrained within reasonable limits.[1] This suggests that when maximizing such benefits is the goal, concentration of effort toward union placements to insure that the greatest number possible will remain in training to become full union members is an appropriate priority.

Earnings Benefits from Other Job Placements

The discussion of earnings benefits to union placements included earnings

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[1] See Appendix E for discussion of parameter estimates.

in jobs other than the building trades unions for those who had terminated from union training. A large number of individuals who were pre-apprentice trainees (266 over the period 1971-1975) were placed directly into other jobs. The benefits of increased earnings of these placements in other jobs, if due to the Plan experience, are to be counted as program benefits. Consistency requires that if increased earnings of union placements is attributed to the Plan the same reasoning must apply for these other job placements. The Research Team has been unable, however, to obtain data concerning the number of placements in various types of jobs or the wages earned in these jobs. Interviews with persons at Opportunities Industrialization Center who work in the placement of persons in non-union jobs and independent sources of information have yielded an estimate of $7,000 as the median annual income of persons placed by the Plan directly in other jobs.[1]

This estimate of annual earnings is assumed to continue over the projection period of 30 years and the difference between the present value (discounted at 10%) of this stream of earnings and the present value of the stream of earnings estimated for non-participants is counted as program benefits. These earnings benefits are $55,800 per other job placement or a total program benefit of $14.8 million. Other job placement earnings benefits are added to the union placement earnings benefits and the assumed annual earnings in these other jobs is varied to test the sensitivity of the total benefits estimate to this assumed value of $7,000. The results are presented below:

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[1] A complete discussion is provided in Appendix E.

Assumed Value of Annual Earnings in Other Jobs (Thousands of Dollars)	Total Earnings Benefits of Program (Millions of Dollars)
5.0	61.9
6.0	64.4
7.0	66.9
8.0	69.5
9.0	72.0

This indicates that the total earnings benefits of the program is not highly sensitive to other jobs earnings.

Benefits Not Quantified

Other Benefits of Increased Employment

Benefits of increased employment are not restricted to the pecuniary benefits captured by the size of the paycheck. Along with the pecuniary benefits accrue non-pecuniary benefits of job satisfaction, better working environment, increased status in the working community and financial security. These benefits may accrue for all jobs in which Plan participants are placed. In addition, for those placed in union jobs there are additional pecuniary benefits which are not included in the calculations of wage-based earnings. While these benefits vary from union to union, they include insurance and retirement benefits and job security.

Reduced Government Service Expenditures

It is suspected that increased employment and increased income for minority members might reduce crime and racial tensions with a corresponding decrease in government expenditures for criminal justice and social services. Although these benefits are believed to exist, no effort has been made to substantiate or quantify them.

Benefits of Increased Minority Participation in the Building Trades Unions

A benefit ignored thus far in the analysis is simply that of increased membership for blacks in the trades unions. While this is a benefit that can certainly not be quantified, it may in fact outweigh all the other benefits noted in the analysis. The mere fact that the program was funded implies that society, through its political system, places a high value on the redistribution of employment opportunities and incurs a high cost when these opportunities are denied.

COSTS OF THE PITTSBURGH PLAN

The costs of the Pittsburgh Plan for its operation during 1971-1975 fall into three major categories; budgeted funding (both Federal and State), the foregone earnings of pre-apprentice trainees while they are attending training classes and funding by a private foundation [1] of a separate "Field Supervisor" program (to the extent that this last category should be assigned as a true cost of Plan operation).

In this analysis the Field Supervisor funding, providing salaries for a staff of six counselors for the years 1972 and 1973, is not included as a cost. This funding was not channelled through the Pittsburgh Plan budget and it is not known to what extent the use of these funds was under the full control of Plan management. For these reasons this separate funding is noted but not included as a cost of the program.

The total budget (excluding trainee stipends) of the Pittsburgh Plan for 1971-1975 is approximately $3.3 million. Examination of the budget indicates that the non-personnel expenditures included no purchases of items for which market prices should reflect substantial deviation from a true measure of resource usage (as is typical for inputs supplied by monopolistic producers). In addition the salaries appear to be commensurate with the job titles and work performed. The budget is therefore taken as an adequate measure of true resource usage or cost. Trainee stipends, being transfer payments, are not included as costs. (See Appendix D for further discussion.)

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[1] The Edgar Kaufmann Foundation.

The opportunity cost of trainees (foregone earnings) is estimated by using the median average income in the last year before Plan entry reported on DOL MA-101 forms for pre-apprentice trainees. The additional information required is the time spent or number of days attended which is obtained from DOL MA-102 forms for the pre-apprentice trainees. The opportunity cost for direct placements is negligible as these individuals are required to sacrifice no time from employment they might be holding while seeking assistance from the Pittsburgh Plan. The estimated total trainee opportunity cost is $454,000. (See Appendix D for details.)

The total resource use of the Pittsburgh Plan for the period 1971-1975 is estimated to be approximately $3.75 million.

COMPARISON OF BENEFITS AND COSTS

In order to compare the program costs to the benefits, which are accrued over a long time period, it is necessary to discount the benefits to give a present value estimate. This has been done in the previous discussion of the individual elements of program benefits (as well as in Appendix E). Comparing the present value of costs with the present value of benefits gives an indication of the desirability of the program investment from the perspective of resource usage and productive output. Performing this calculation yields the following result:

Total Program Benefits	$66.9 million
Total Program Cost	$ 3.75 million

SUMMARY

The measure of program benefits used is the expected increase in lifetime earnings of Pittsburgh Plan participants due to the services provided by the Plan. Costs are estimated by the budgeted value of staff wages and other costs of program operation as well as the foregone earnings of those trainees enrolled in the full-time pre-apprentice program. Estimates of increased earnings total $52 million for union employment and $15 million for employment in other jobs or a grand total of $67 million as an estimate of program benefits. Total program cost is estimated to be $3.8 million.

Several assumptions, some rather extreme, are required in order to count the total increase in earnings as program benefits. These caveats are discussed fully in Appendix E.

CHAPTER 7

COST ANALYSIS RELATING RESOURCE USAGE TO OUTPUT

In the prescriptive part of this report the Research Team presents its findings and recommendations for future manpower programs, particularly those related to minority entry into the building trades unions. In doing so, hindsight is applied specifically to the Pittsburgh Plan and its operation for the budget years 1971-1975. Where these statements would affect the resource committment to various activities or program functions a description of the historical resource allocation as practiced by decision-makers in the Pittsburgh Plan is a convenient datum. Various breakdowns of costs are presented, the most prominent being that related to route of union placement, pre-apprentice versus direct placement.

Program cost is essentially of two types, that represented by the Pittsburgh Plan budgets and that represented by the time investment of trainees actually attending training classes (pre-apprentice only). The cost of trainees' time is estimated to be simply equal to their income for a similar time period during the year prior to their entry into the Plan process. The cost analysis then concentrates on those costs represented by budgeted expenditures.

PROGRAM BUDGETS

During the years 1971-1974, the Pittsburgh Plan was funded from two sources:

1) "Phase I": U. S. Department of Labor, Office of National Projects for recruitment, selection, counceling, placement and follow-up.
2) "Phase II": State of Pennsylvania, Department of Public Instruction, Pennsylvania Manpower (M.D.T.A.) and Community Affairs to provide institutional instruction for the pre-apprenticeship trainees.

In addition, funding was provided for a "Field Supervisor" unit through the Edgar Kaufman Foundation (and the Turtle Creek Model Cities Program) to serve those placed in union training.

In 1975, the funding framework shifted as "revenue-sharing" was implemented and the monies for the Pittsburgh Plan were channelled through this new mechanism. The cost analysis reflects this change in funding source. Tables 23 and 24 show the breakdown of funding for 1971-1975.

Table 23 Gross Budget Breakdown by Funding Source (Thousands of Dollars)

	1971	1972	1973	1974	1975	Total
U. S. Dept. Labor	434.4	320	320	310.7		1385.1
State (M.D.T.A.)	603.7	300	300	192.5		1396.2
Revenue-Sharing					514.4	514.4
TOTAL	1,038.1	620	620	503.2	514.4	3295.7

Table 24 Gross Budget Breakdown by Funding Recipient (Thousands of Dollars)

Pittsburgh Plan Component	1971* PH I[a]	PH II[b]	1972* PI	PII	1973* PI	PII	1974* PI	PII	1975*	TOTAL
Administrative Committee	22.7	--	24	--	24	--	10.6	--	23.5	104.9
Coordination Unit	60.7	--	71	--	71	--	71	--	79.5	353.2
Bidwell	120.5	208.2	75	100	75	100	76	61.4	134.1	950.2
DIG	124.8	203.4	75	100	75	100	75.2	66.9	134.8	955.1
OIC	105.6	192.1	75	100	75	100	77.8	64.2	142.5	932.2
TOTAL	434.4	603.7	320	300	320	300	310.7	192.5	514.4	3295.7

*From DOL and State funding proposals, Office of the Coordinator, Pittsburgh Plan

[a]indicates "Phase I" expenditures and corresponding funding

[b]indicates "Phase II" funding

[c]column and row sums are not exact due to rounding error

TRAINEE STIPENDS

In addition to the funding in the tables shown above, additional expenditures occured in the form of stipends paid to trainees enrolled in the Pittsburgh Plan. These stipends are shown below in yearly totals.

Total Trainee Stipends Paid (Thousands of Dollars)[1]	
1971	745.
1972	288.
1973	288.
1974	297.
1975	285.6
Total	1903.6

The source of funding for these stipends is the Manpower Development and Training Act. While the stipend payments are program expenditures, they are simply transfer payments which represent no real resource cost to the economy, and as such, are not included in the benefit-cost calculation or the cost analysis.[2] Total program expenditures are displayed in Table 25.

COST BREAKDOWNS

The following expenditure summary, Table 26, extends a similar analysis of the Research Proposal over the full period 1971-1975. Essentially a breakout of Table 25 to distinguish between personnel and other costs, it indicates that the Pittsburgh Plan has over its entire history been a very labor intensive operation. For the five year period the costs are estimated to have been incurred as follows:

	Per Cent Personnel Cost	Per Cent Other Cost
1971	84.3	15.7
1972	75.2	24.8
1973	83.8	16.2
1974	85.7	14.3
1975	82.8	17.2
TOTAL	82.5	17.5

[1] From records of the Coordinator's Office, Pittsburgh Plan

[2] Edward B. Jakubauskas and Neil A. Palomba, Manpower Economics, Addison-Wesley, 1973, p. 235.

Table 25 Expenditure Breakdown including Trainee Stipends (Thousands of Dollars)

Total Expenditure Breakdown	1971	1972	1973	1974	1975
Recruitment, Selection, Counseling, Placement, Follow-up (PHASE I)	434.4	320.0	320.0	310.7	514.4
Pre-Apprentice Training (PHASE II)	603.7	300.0	300.0	192.5	
Trainee Stipends	745.0	288.0	288.0	297.0	285.6
TOTAL	1783.1	908.0	908.0	800.2	800.0

Grand Total of Program Expenditures 1971 through 1975 $5199.3

Table 26 Detailed Breakdown of Pittsburgh Plan Expenditures

(Thousands of Dollars)

	1971				1972			
	PHASE I		PHASE II		PHASE I		PHASE II	
	Total Personnel Costs	Total Other Costs	Total Personnel Costs	Total Other Costs	Pers	Other	Pers	Other
Administrative Committee	14.000	8.736	N.A.	N.A.	16.700	7.300	N.A.	N.A.
Coordination Unit	53.077	7.612	N.A.	N.A.	61.096	9.904	N.A.	N.A.
BID	104.630	15.950	172.476	35.735	65.500	9.500	63.053	36.947
DIG	102.589	22.145	67.000	8.000	57.680	42.320	62.220	42.320
OIC	80.539	25.032	166.555	25.531	60.605	14.395	74.351	25.649
TOTAL	354.835	70.560	520.325	83.410	270.901	49.099	195.084	104.916

Table 26 Condt.

1973				1974						1975	
PHASE I		PHASE II		PHASE I		PHASE II		PHASE I		PHASE II*	
Pers	Other	Pers	Other	Pers	Other	Pers	Other	Pers	Other	Pers	Others
20.200	3.800	N.A.	N.A.	9.460	1.190	N.A.	N.A.	18.445	5.055	N.A.	N.A.
64.160	6.840	N.A.	N.A.	64.840	6.160	N.A.	N.A.	70.340	9.165	N.A.	N.A.
68.260	6.740	75.196	24.804	69.310	6.690	46.000	15.370	83.353	20.288	26.941	3.500
62.220	12.780	77.029	22.971	59.050	16.190	59.046	7.823	67.937	26.454	39.077	1.29
64.960	10.040	87.297	12.703	69,250	8.540	54.274	9.946	81.448	19.034	38.455	3.591
279.800	40.200	239.522	60.478	271.910	38.770	159.320	33.139	321.523	79.996	104.473	8.381

*Only one contract (not Phase I and II) in 1975 - these are estimated breakdowns by analogous functions (recruiting, follow-up, teaching, etc.)

The Research Team has developed a cost breakdown which estimates the historical committment of Pittsburgh Plan resources to each program function (teaching, recruiting, etc.). This breakdown, coupled with the Team's conclusions regarding the crucial activities related to placement success, is a potential base of information for future program design.

Interviews with Plan staff revealed that a simple cost breakdown based only on staff positions or job titles is not very meaningful. Staff members often perform multiple program functions. In order to isolate costs by function this situation required a more complex estimating procedure (described in detail in Appendix D). The results of the functional cost breakdown are shown in Table 27. The figures in parentheses represent the percentage of resources committed to each function for each column total. While the estimates for each organization Bidwell, Dig, and OIC, may reflect the biased perspective of individual staff members who participated in the functional cost development, the total functional breakdown is believed to be quite realistic and represent the most rigorous breakdown possible.

The cost breakdown of greatest policy significance relative to program design is formed by combining the results of Table 27 with a knowledge of the extent to which each of the functional services is provided to the individual placed through the pre-apprentice program and to the individual placed directly.[1] This provides an estimate of the differential costs of processing individuals through the two major routes to placement in union training and eventually to full journeyman status in the building trades unions.

A general view of the cost assignment to placement type, pre-apprentice and direct, is given in Table 28. A somewhat more detailed assignment was used in the actual calculation of cost per placement and is discussed in Appendix D.

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[1] See Chapter 2 for a discussion of PAP and direct placement processes.

Table 27 Cumulative Resource Usage by Program Function and Training Organization* (1971 through 1975) (Thousands of Dollars)

EFFORT	BID	DIG	OIC	TOTAL
Recruit	30.078 (3.2)	27.945 (2.9)	31.993 (3.4)	90.016 (3.2)
Select for PAP	1.500 (.16)	80.874 (8.5)	2.678 (.29)	85.052 (3.0)
Counsel (In-House)	131.014 (13.8)	84.26 (8.8)	79.694 (8.5)	294.969 (10.4)
Train/Teach	246.206 (25.9)	167.888 (17.6)	237.898 (25.5)	651.992 (23.0)
Select/Place	62.102 (6.5)	47.562 (5.0)	54.104 (5.8)	163.768 (5.8)
Follow-up	129.837 (13.7)	140.284 (14.7)	132.227 (14.2)	402.348 (14.2)
Other	127.633 (13.4)	132.794 (13.9)	216.289 (23.2)	476.716 (16.8)
Not Assigned by Salary	221.833 (23.3)	272.488 (28.5)	177.117 (19.0)	671.438 (23.7)
	950.2 (100)	955.1 (100)	932.0 (100)	2837.3 (100)

*Based on:

(1) Best estimate of budget assignments to job titles (i.e., total budget assignments to Recruiter, Teacher, etc.)

(2) Best estimate of functional breakdown of effort by persons with each job title

Table 28 Functional Cost Assignment to Placement Type (thousands of dollars)

FUNCTION	BUDGETED	ASSIGNED TO
Recruitment	90.016	All placements[a]
Selection for PAP	85.052	PAP
Counseling (In-House)	294.969	PAP
Training	651.992	PAP
Selection/ Placement	163.992	All placements
Follow-up	402.348	All placements
Other[b]	476.716	All placements
Administrative Committee and Cordination Unit	458.080	All placements
Miscellaneous[c]	671.438	All placements

(a) Recruiting is done for PAP and direct placements simultaneously

(b) Personnel costs at training organizations not assignable to previous functions

(c) Training organization costs other than personnel costs.

Placements for 1971-75 totaled 252 for the PAP route and 556 for the direct route. The average budgeted cost per PAP placement is estimated to be be $9,100.[1] The average budgeted cost per direct placement is estimated to be be $1,770.[2] It should be noted that the cost per placement includes costs of follow-up which are incurred following actual job placement. These costs of follow-up are approximately $500 per placement. An important assumption is that all budgeted costs are assigned to union placements in this breakdown;

[1] "budgeted cost" does not include trainee opportunity cost.

[2] These two cost estimates are used in the Transportation Model comparison of the PAP and direct placement routes (see Chapter 10).

the investment in other PAP trainees (some of whom obtain other employment) is counted as a cost of union placements.

If those PAP trainees who obtained "other jobs" (total of 266 for 1971-1975) are counted as placements and the costs of functions "recruitment" through "training" of Table 28 are divided equally between all individuals placed,[1] the cost per placement is estimated to be the following:

budgeted cost per PAP placement in union	$5,030
budgeted cost per direct placement in union	$1,780
budgeted cost per PAP placement in other jobs	$3,870

This is a more realistic view of the cost per placement and hence these estimates are the ones used in other analyses.

Unit costs - Costs per Person Served

An important way to view the costs of the Pittsburgh Plan is to consider the cost of providing each of the services per person served. These unit costs are presented for each function below:

Function	Total Persons Served	Unit Cost (Dollars)
Recruitment	6,185	14
Selection	1,429	60
Counseling (in-house)	1,429	206
Training	1,429	436
Selection/ Placement	808	203
Follow-up	2,424 (person-years)	165 (person-years)

SUMMARY

For the period 1971-1975 the total program expenditures of the Pittsburgh Plan were approximately $5.2 million of which approximately $1.9 million was paid out as pre-apprentice trainee stipends. Of the $3.3 million funding for program operation, approximately 82% was spent on payroll and other personnel costs.

Considerind all costs (including follow-up of placements) to have been incurred by those persons actually placed in union training or other jobs (and

[1] Analysis included in Appendix D indicates that this is a reasonable assumption.

ignoring the foregone earnings of trainees enrolled in the pre-apprentice program) the following are the estimates of total cost per person placed in a job:

pre-apprentice trainee placed in union training	$5,030
individual placed directly in union training	$1,780
pre-apprentice trainee placed in other jobs	$3,870.

CHAPTER 8

A BENEFIT-COST COMPARISON OF PAP AND DIRECT PLACEMENTS

Since its inception the Pittsburgh Plan has in actuality been two programs operating in a parallel fashion. These programs are; (1) vocational and remedial academic training for minorities (with building trades unions as one employment option); (2) direct placement of minorities in building trades unions. These programs are displayed in Figure 18.

The similarity between these programs is that both operate with the intent of increasing minority representation in the unions. The differences between the programs are enormous, especially in the measure of true results, the number of minority journeymen added to the unions per dollar spend.

The direct program recruits persons who are older, with higher incomes a and greater job experience. Direct placements have a higher income and greater job experience. Direct placements have a higher probability of remaining in union training to become journeymen once placed. The direct program is much less expensive than the training program and focuses more intensely on the crucial task at hand, the placement and retention of minorities in the unions. The training program is burdened with the task of sustaining persons through a remedial education program and yet not producing trainees (of those remaining at the program's end) who are effective competitors in the job market.

The fact is that of all persons who enroll in the pre-apprenticeship training program, only about 10% will become union journeymen. If the goal is to increase the number of minority journeymen then the training program clearly has too many intervening processes and points where persons can fail.

Figure 18 displays the proportion of persons that have historically followed each possible flow path through the system and the associated costs and benefits.[1]

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[1] For a full discussion see Appendices D and E.

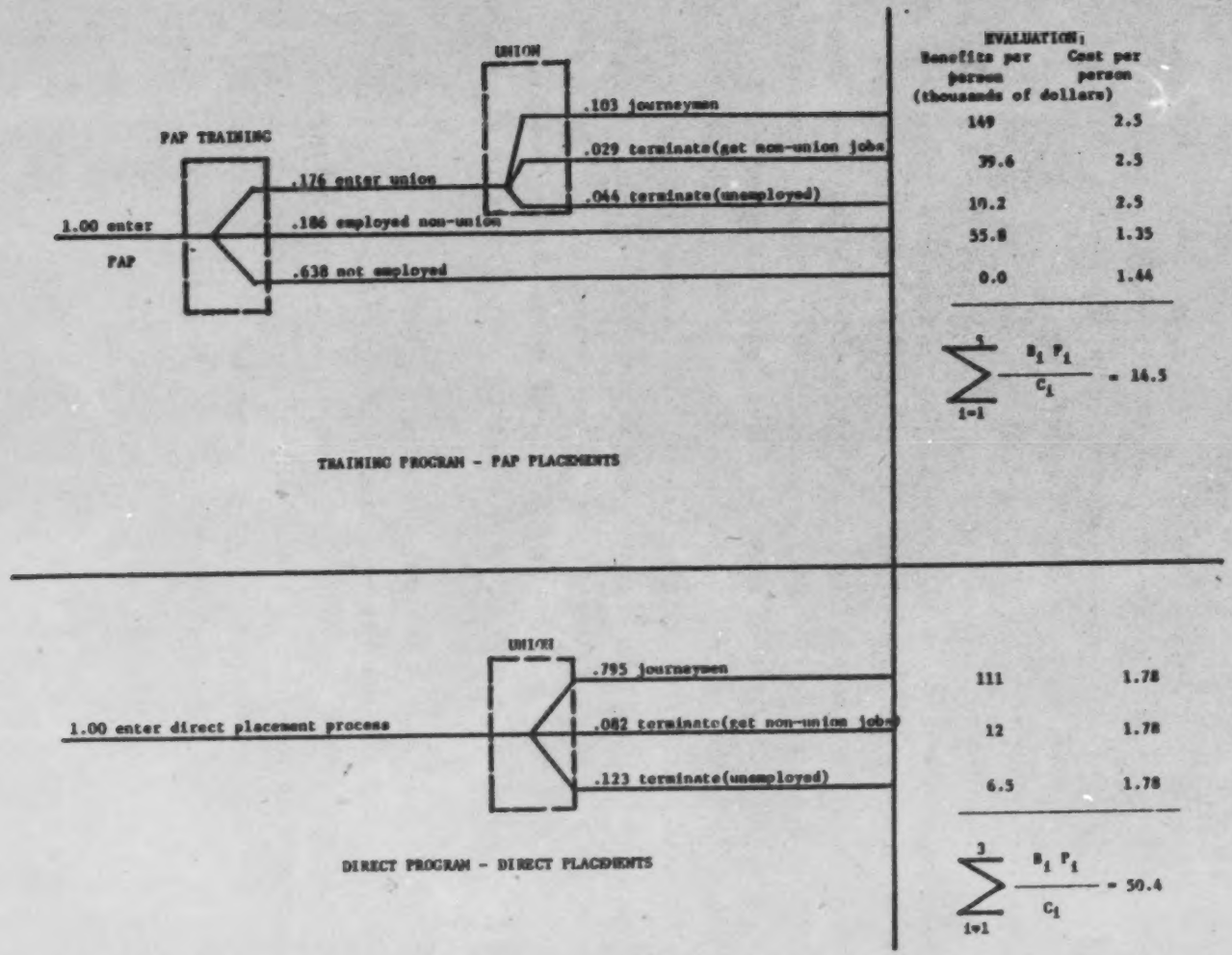

Figure 18 Benefit-Cost Comparison of Placement Types

A simple calculation which weights the benefits divided by costs by the proportion of persons taking each path, i.e.; $\sum_i (\text{benefits}_i \times \text{proportion}_i)$ cost_i for each path i, yields a weighted benefit-cost ration of 50.4 for the direct program and 14.5 for the training program. This indicates that the direct program is far more efficient in increasing earnings as well being clearly superior in directing its energies toward the goal of increased minority representation in the unions.

The two programs, that for direct placements and that for PAP placements, have been in direct competition. These two programs have been subjected to the same external forces; unions, contractors and the employment slowdown in the construction industry. This competitive "testing" has shown that, for the specific criterion of a weighted benefit-cost comparison, the direct placements is superior.

CHAPTER 9

UNION PLACEMENT

INTRODUCTION

In Part I we have seen, in a variety of ways, the manner in which the Pittsburgh Plan and its participants function. Extensive analysis of participants, success profiles, failures, and benefits and costs were conducted. Where quantitative analyses were not possible, descriptive analysis was presented. In Part II (i.e., Chapters 9 and 10) we will try to pull all this information together and formulate a set of recommendations for the pre-apprentice program and for union placements.

Ideally, one would like to calibrate the effectiveness of the Plan with data from similar plans across the country. Despite an extensive search we have no data available for this purpose. In the absence of such calibration, one can interpret the results of our analysis in the light of ones choice. It is, however, almost a truism that anything can be improved especially if it is a human services program. In the following sections we shall take up each of the three major components of the Pittsburgh Plan and discuss some guidelines for formulating informed policies. Figure 19,which is reproduced from Chapter 2, is attached so as to facilitate easy reference to the various components of the Pittsburgh Plan.

For purpose of clarity it will be useful to consider the placement process as beginning with the pool available for placement rather than the PAP. (See Figure 19.)

Deferring for the moment the question of who to recruit and select, there are some recommendations that can be made about the very processes involved in these two activities. Briefly, the recommendations suggested are: some screening of individuals being placed in the "active files" or mailing lists for union tests; improvement in the screening of individuals before they are processed for union testing; improved orientation and test preparation of those selected to try to get into a union.

In general, when a union announces that it is accepting applications, the three organizations send out a proforma letter to <u>all</u> individuals on their active files or what amounts to the same thing their mailing list. The process by which an individual can get on this list is: he can walk in and express interest in the Plan; he could be a graduate of the PAP not yet

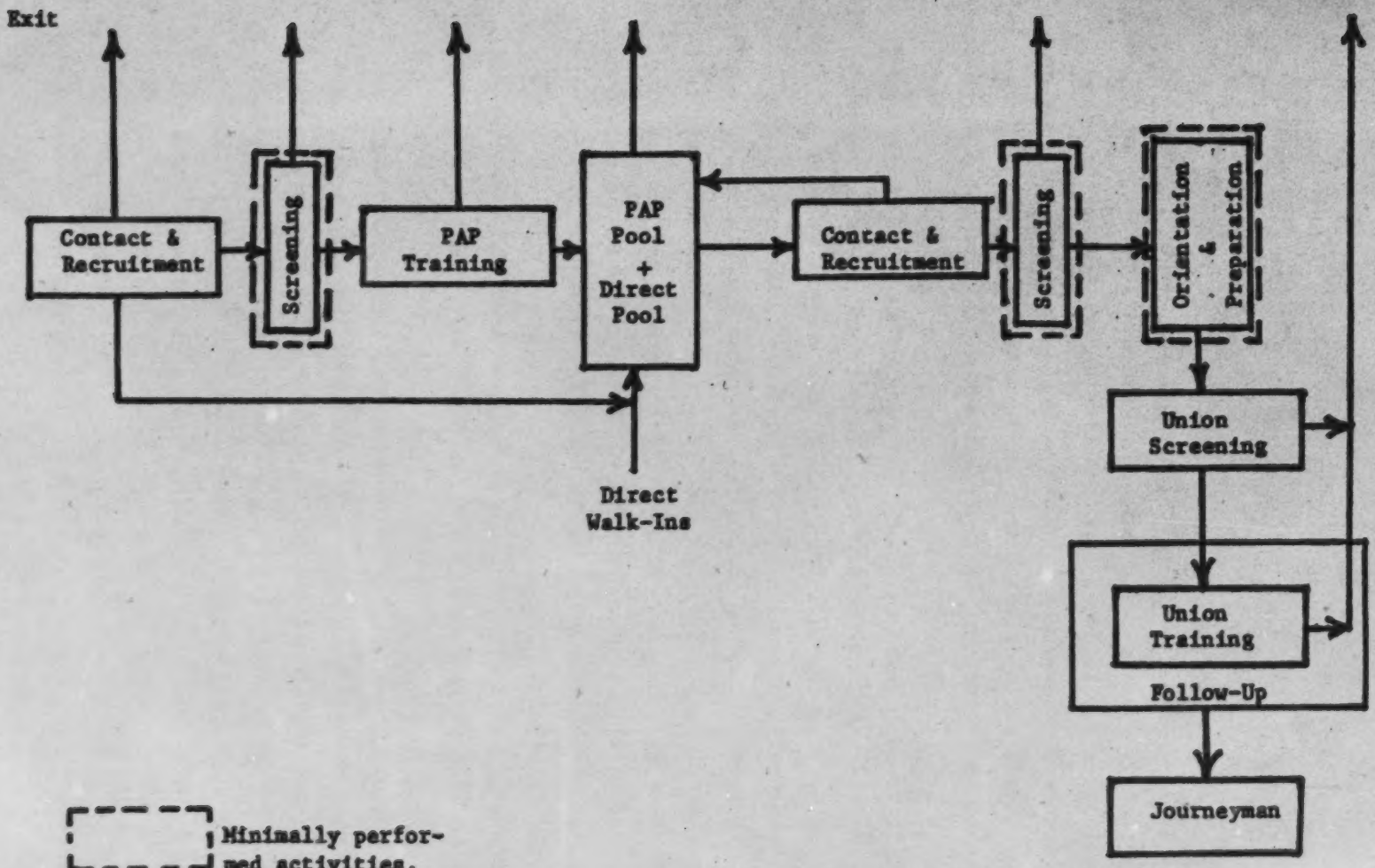

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Figure 19 Mass Flow Diagram of the Pittsburgh Plan

placed; he could have tried to enter the PAP and was unable to do so; and, finally he could have been contacted directly by a member of the Plan staff. Using this system the organizations contact as best they can given their limited resources, as many individuals as express some interest in joining the construction industry. The simple screening process we suggest is the maintenance of such information as the top three unions of the individual's choice. This would enable them to contact only that subset of people who have expressed an interest in the specific union in question and thus save themselves some money and a great deal of time.

In general, if an individual calls in and responds positively to the letter he is processed for union screening. Applicants are screened by the organizations so that those who do not obviously meet the union's stated criteria are removed from the list. This process can be a very expensive one. There are costs incurred in:

(1) processing all those who respond, however perfunctorily
(2) the possibility that an individual perhaps slightly less qualified for the union but with sufficient interest to succeed being supplanted by one better qualified but without the necessary interest to sustain him through the demanding training program
(3) union application fee costs[1]
(4) the loss of a negotiated slot in the union if the individual in question terminates for reasons other than normal, i.e., he finds a job in another union in which he has greater interest and therefore quits one to join the other.

Therefore careful screening coupled with adequate processing (discussed below) should significantly reduce the above costs.

At present there appears to be a strong need to acquaint direct placements, especially those trying to get into the apprentice training program, with the facts about the union work environment. In addition, the information given to the PAP's in their program would have to be updated during and/or at the end of the training periods. The reason for this is that entry into a union training program with little knowledge of the environment proves to be disastrous for the individual and thus for the Plan.

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[1] The practice of paying union application fees for the individual has currently been stopped.

Preparation for the Pennsylvania Bureau of Employment Security Test and/or the union test (if applicable) should be given to all. Some direct placements have been out of school for a long time and probably have not taken tests in as long a period. The PAP trainees may be allowed to take part in this training especially since theoretically, they are at this stage at the same level as those who did not have to go through the PAP.

THE RECRUITMENT TARGET POPULATION

The focus of much of this research has been the identification of the most successful type of individual for union placement. In this context the profiles of success developed were not very useful for two reasons:

(1) While the models developed for the PAP program were reasonable and did not reveal any contradictions, this segment of the Pittsburgh Plan contributed less than a third towards union placements the rest being direct placements. As mentioned in Chapter 4 similar analyses for direct placements (or potential placements) were not done due to lack of data;

(2) The models developed for the journeyman level of success were both very poor and extremely contradictory in their indications.

There are however, extensive analyses of failure, costs and benefits for different populations. For all these analyses the sub-populations that became the focus of attention were defined by what may be thought of as placement route i.e., those who came directly into the union screening process and those who had to receive some training prior to entering the screening process. In virtually every instance the results justified the attention paid to these two sub-groups. Final confirmation was received from the results presented in Chapter 8 where the results of all the above analyses were pooled together to compute the weighted or expected, sum of benefit-cost ratios. The dominance of the weighted sum of benefit-cost ratios calculated for direct placements over that calculated for PAP placements suggests that the population to recruit from would not be the PAP trainees. To confirm these findings some sensitivity analyses were performed and the results (reported in Appendix J) clearly demonstrate the extent to which reality needs to be twisted in order to make it beneficial to recruit and place PAP trainees. Note that this result would probabily not hold true if the primary function of the Plan were not union placements, i.e., if the basic criterion was not union placements but simply successful termination from the PAP.

Quite simply, the PAP trainee requires heavy expenditures and is highly prone to terminate from union training programs. Even though the net benefit figure for a PAP trainee is higher than for a direct placement, the above two factors when combined represent too great a loss to be borne by the additional benefits.

An alternate approach to this question is via the transportation model presented at the end of the chapter. The fundamental difference is that in the transportation model benefits are maximized irrespective of the associated cost and the necessary trade-offs made only when a constraint (such as the budget) is tight. On the other hand, using the weighted sum of benefit-cost ratios does not allow for any such benefit maximization but incorporates the costs involved right from the beginning. As a result, while with an adequate budget the transportation model may dictate a mixed recruiting policy, the weighted sum of benefit-cost ratios would always dictate the selection of direct placements only.

As formulated a variety of alternative approaches may be used with the transportation model. As may be expected from the analysis of benefit-cost ratios, under a policy of cost minimization only direct placements are chosen. Under any other policies the transportation model indicates that in general, a mixed recruitment policy is the optimal one. Extensive experimentation with the model shows that it is not possible to recommend any fixed recruitment strategies; the only general statement that can be made is that as the budget gets tighter, the shift is away from PAP placements towards direct placements, a result only to be expected given the analyses presented so far. To utilize the model, the specific situation would have to be characterized and the model exercised to yield the best recruitment strategy.

It is clear therefore, that the type and number of individuals to be recruited depends critically upon ones policy priorities. The trade-offs where they exist, have been enumerated and via the transportation model, a mechanism created to make explicit these trade-offs and determine the best policy. Further, there are benefits not taken into consideration while making calculations for both the transportation model and the weighted sum of benefit-cost ratios. (These are discussed in Chapter 6). Ultimately therefore recruiting policy will follow from other policy decisions and hence despite the unequivocal result of the weighted sum of benefit-cost

ratios this report continues to focus attention on the PAP.

FOLLOW-UP OF UNION PLACEMENTS

The tasks of Field Supervisors are not easy ones. (See Chapter 3 for additional information of Field Supervisors' duties.) The very nature of the population with which the Field Supervisor is dealing is nebulous. Many are avoiding bill collectors. Others are in transit due to their sudden rise in income. Others still, care to have nothing to do with the Pittsburgh Plan, which served as a stepping stone in their climb to "success". Of those who do consciously contact the Field Supervisors, the majority are facing a crisis. As soon as the crisis is over, the trainee more often than not once again disappears from sight.

The nature of problems handled by the Field Supervisor are primarily job related. Many trainees, althought they are given some orientation as to the structure and activities within unions, are taken aback when they encounter the actual union situation. The job may be more demanding than previously expected. The trainee may be in need of transportation to get to the job site. The trainee may lack motivation to attend classroom sessions after a long day on the job. There are also racial tensions, although the general feeling of the Field Supervisors is that these are decreasing.

It is for this reason that the follow-up information collected by the Field Supervisors is shaky at best. It is this follow-up information; however, which plays an essential role in the evaluation study of any such program.

The need for better follow-up information is obvious. How to obtain this information from an uncooperative source is yet another question. One intuitive solution is to lighten the case load of each field supervisor. The work loads of the field supervisors have increased over time as the number placed increases and the number of terminations decrease.

Table 29 Cumulative Work Load of Follow-up Counselors/Field Supervisors

	1972	1973	1974	1975
Cumulative On-Board	255	395	436	509
Number Receiving Journeyman's Book	11	8	41	26
Number of Terminations	98	42	40	37

As Table 29 shows, the Field Supervisors had almost twice as many persons to follow-up in 1975 as in 1972, yet the same number of Field Supervisors were on the staff. In fact, since the beginning of the Field Supervisor program, they have taken on additional tasks, such as recruiting and screening before placement.

Besides lightening the case load per supervisor, well-trained personnel are necessary in order to increase the effectiveness of the Field Supervisor. In order to attract highly qualified personnel, more dollars in the budget may need to alloted for the salaries of these people. If not already experienced, some sort of orientation would also be helpful to familiarize them with union problems and jargon before granting their job. This would eliminate the amount of time spent blundering on the job before the new field supervisor becomes used to the "ropes".

The manner of record keeping by the Field Supervisors also needs to be revised. It is the records kept by the Field Supervisors which make up the monthly statistical narratives distributed by the Co-ordinators Office. The information in the monthly narratives does not reflect the monthly employment trends of the trainees. One brief phone call to the trainee may represent the status of the trainee for the entire month, but in reality is only representative of the day on which the trainee was contacted.

The efforts of the Field Supervisors are essential to the workings of the Pittsburgh Plan. Whether the person placed went through the pre-apprenticeship program or not is unimportant. Once the trainee is placed in a craft union the most crucial phase of the Pittsburgh Plan begins. The trainee has been awarded a slot which, if he leaves the union, will not be refilled by a minority worker. It is here, therefore, that the initial investment of time and training is placed on the line. Subsequently, a considerable amount of supervisor effort should be concentrated at this stage. Based upon the results of analyses of failure patterns, it is also recommended that special attention be paid to a placement in the second year. For reasons not yet known, it is this period that appears to produce the maximum failure rate for union placements. As the transition probability matrices in Appendix F show, this phenomenon appears to apply to all cross-sections of placements.

The Field Supervisor holds the key to the journeyman's book. He can help ease the way for the trainees, thrown into an unknown and potentially hostile environment, by working with the trainees, foremen and business agents to form a more harmonious working situation. While it was not possible to bolster our recommendation using quantitative analyses, the concept of field supervisors is not new and has received similar support from other work in this area.[1] The very unsure and unsteady nature of employment in the construction industry especially for a trainee, the discipline required and the occassionaly hostile reaction to the trainee either of his family (especially the spouse) or his work mates all add up to a very rough combination for an individual to face alone.

THE TRANSPORTATION MODEL

When there are a variety of alternatives available and many trade-offs to be taken into consideration in the choice of a particular one, a mathematical model is particularly useful. Further, one inherent part of decision-making in the face of these alternatives is the evaluation of the ramifications of any particular choice or decision. This is ture both at the level of policy formulation as well as the level of day-to-day management and once again such a mathematical model would be useful. The transportation model (developed in detail in Appendix G) is one such simple model. It allows one to determine the optimal (or best) number of inputs types to be 'transported' to output or destination types. In this model the two input types were: (1) PAP placements and (2) Direct placements; and the output types were: (1) journeymen; (2) non-union jobs and (3) prior employment status (or prior status). Four general objectives were formulated to investigate some of the main possible obectives. They were:

(1) Cost minimization under the constraint that all training slots be filled;

(2) Cost minimization under the constraint that all journeymen slots be filled;[2]

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[1] See for example Ferman, Louis , Job Developement for the Hard to Employ, University of Michigan: Ann Arbor, 1969, or Hasenfeld, Yeheskel, Manpower Placement: Service Delivery for the Hard to Employ, University of Michigan: Ann Arbor, 1973.

[2] A journeyman slot constraint was formulated to explore the ramifications of negotiating journeymen slots as opposed to the current practice of negotiating only training slots.

(3) benefit maximization under the constraint that all training slots be filled;

(4) benefit maximization under the constraint that all journeyman slots be filled.

For further details of the model see Appendix G.

A large number of alternative values for the parameters were used to test the model. With formulations (1) and (2), in all cases only Direct placements were chosen. With cases (3) and (4) the solution depended upon the values of the budget and slots. Due to the variability and the infinite number of alternative parameter specifications possible, only a few sample problem runs are presented below:

RUN 1 - Minimize costs subject to filling 200 training slots

Solution	JMEN	Non-union	Prior Status
PAP	0	0	0
DIRECT	159	16	25

Cost = 356.99[1]

Benefits = 17961.522 i.e., 0% PAP trainees selected

RUN 2 - Minimize costs subject to filling 200 journeymen slots

Solution	JMEN	Non-union	Prior Status
PAP	0	0	0
DIRECT	200	21	31

Cost = 449.056

Benefits = 22600.324 i.e., PAP trainees selected

RUN 3 - Maximize benefits subject to: (1) filling 200 slots; (2) budget less than or equal to 800

Solution	JMEN	Non-union	Prior Status
PAP	80	23	34
DIRECT	50	5	8

Benefits = 18855.7 i.e., 68.3% PAP trainees selected

[1] All dollar amounts are in thousands

RUN 4 - Maximize benefits subject to: (1) filling 200 journeymen slots; (2) budget less than or equal to 400

Solution	JMEN	Non-union	Prior Status
PAP	56	16	23
DIRECT	144	15	22

Benefits = 25436.2 i.e., 34% PAP trainees selected and 270 trainee slots are required.

RUN 5 - Maximize benefits subject to: (1) filling 200 training slots; (2) budget less than or equal to 800

Solution	JMEN	Non-union	Prior Status
PAP	8	2	3
DIRECT	148	15	23

Benefits = 18049.7 i.e., 65% PAP trainees selected.

RUN 6 - Maximize benefits subject to: (1) filling 200 journeymen slots; (2) budget less than or equal to 400

PROBLEM INFEASIBLE i.e., given the budget it is not possible to fill all 200 journeymen slots.

RUN 7 - Maximize benefits subject to: (1) filling 200 training slots; (2) budget less than or equal to 1000

Solution	JMEN	Non-union	Prior Status
PAP	117	33	50
DIRECT	0	0	0

Benefits = 19258.6 i.e., 100% PAP trainees selected

RUN 8 - Maximize benefits subject to: (1) filling 200 journeymen slots; (2) budgeted less than or equal to 1000

Solution	JMEN	Non-union	Prior Status
PAP	87	25	37
DIRECT	113	12	17

Benefits = 07055.2 i.e., 51% PAP trainees selected and 291 training slots are required.

RUN 9 - Maximimze benefits subject to: (1) filling 200 training slots; (2) budget less than or equal to 800. This run assumes an increase in cost of .1 per placement and a reduction in the probability of

termination by 5% to reflect a change in the program

Solution	JMEN	Non-union	Prior Status
PAP	67	17	21
DIRECT	80	8	7

Benefits = 19880.5 i.e., 53% PAP trainees selected

RUN 10 - Maximize benefits subject to: (1) filling 200 journeyman slots; (2) budget less than or equal to 800. The same changes as in RUN 9 are assumed.

Solution	JMEN	Non-union	Prior Status
PAP	43	11	13
DIRECT	157	15	13

Benefits = 24648.6 i.e., 27% PAP trainees selected and 252 training slots are required.

It is worth reiterating that these runs are a mere fraction of all possible runs. The variability of the results with varying parameter values preclude any generalities. A paraphrasing of the mode of operation of the model may perhaps assist in understanding the results. Since the maximum benefits are acheived by selecting a PAP trainee, the model will pick them until it hits up against a constraint. If the budget is large enought (as in RUN 7) only PAP trainees will be selected till the slots constraint is met. On the other hand if the budget gets tight and the allotted slots are not filled, the model begins selecting Direct trainees and trading-off PAP trainees (assuming of course that it can be satisfied, see RUN 6). This leads to some unexpected results. For example, doubling the budget from 400 to 800 (corresponding to an increase of 100%) dramatically alters the recruitment mix from 6.5% PAP to 68.5% PAP; but, the increase in benefits of 806 is barely 5%. (see RUNS 3 and 5).

These characteristics of the model must be recognized when it is exercised. Given a policy decision about priorities, objectives, budgets and slots the optimal solution could easily be obtained from this model. To investigate the effects of any specific policy or programmatic change, the change would have to be translated into a change(s) in one or more of the parameters of the model and once again the model can be used to evaluate the change in terms of recruitment mix, total benefits accrued and the costs involved. For example, if

the follow-up component of the plan were to be strengthened at a cost of .100 per person and the expected result was a 5% reduction in the probaility of termination for both groups, one can use the model to evaluate the effects of the change. RUN 9 shows that all 200 training slots would be filled at a cost of 798 and the benefits increase by 1,025 as compared to the current situation as shown by RUN 3. Similarly, for a journeyman constraint, the benefits decrease by 788 if all the slots are to be filled. While the assumed changes may be unrealistic, this demonstrates the range of applicability of the transportation model and also demonstrates the critical importance of appropriate policy specification.

CHAPTER 10

THE PRE-APPRENTICE PROGRAM

RECRUITMENT AND SELECTION

Due, in part to the large numbers of people contacted by the three training organizations, there is little in the way of selection that is carried out. Other reasons for the absence of screening process cited are, the lack of adequate guidelines for recruitment and criter for selection.

As the PAP is currently structured, the recruiters do not perceive their function as in any was related to selection and screening.[1] In consequence, far too many individuals are recruited (in reality only contacted) and thus an adequate screening process is virtually impossible to implement. Therefore, it is essential that guidelines be set for both recruiting and selection and screening.

Based upon our analysis of successful individuals, two types of individuals have been identified. For reasons of simplicty we will refer to them as the unemployed and the underemployed. (see Appendix G). The unemployed type generally had a very low income in the year prior to entry, (reflecting the type of jobs held) was not a veteran, was comparatively less educated and younger. The underemployed type is the obverse of the unemployed type being older, a veteran, with a higher level of education and higher income.

Depending upon ones perspective, different combinations of these two types of people need to be recruited. As extensively shown later in the discussion on the transportation model, if one wished to maximize benefits alone (for a given budget) then the appropriate group to select from may be the unemployed type. On the other hand, if one wishes to maximize benefits given a certain budget, and given that the union slots must be all filled, then one would select appropriate mixes from these populations. Finally, if one wishes to minimize costs given a certain number of union slots that have to be filled, one would select exclusively from the underemployed population. Naturally these conclusions are based on empirically observed probabilities of different benefits accruing to an individual from each type, on costs incurred by the Plan and on the budget assumed. Therefore, the exact number of trainees to be

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[1] The same individual may in some cases perform the two functions but there does not appear to be any feedback between the two roles.

selected from each type is subject to change. However, the general pattern of these results is reasonably consistent in a number of scenarios tried out using this model. The point is that the population (or population mix) chosen is very dependent upon policy decisions. Other policy choices, when translated into benefits, costs, probabilities and priorities will, using the transportation model developed below, indicate the appropriate selection strategy to employ.

In order for these results to be used in the screening and selection process additional data must be available to the staff of the three training organizations. Currently some standard achievement tests are given but its results are not used as much for screening as for tracking (i.e., selecting the appropriate curriculum for the individual). If these tests were to be combined with fairly in-depth interviews, enough data can be gathered to implement any policy decisions that have been made as regards the entry population mix. While much of the information gathered by recruiters will aid in categorizing an individual by type, interviews are also necessary for four reasons. First there is little question that success (at any level) is to varying degrees governed by such factors as knowledge of the industry, determination and maturity. Such factors have not been quantified by us. Given this, it is the interview which will yield the information required above and beyond the simple characterizations presented above. The second reason is that interviews are the ideal situations for information transfer. A public relations flier or a form filled out upon recruitment does not give the potential trainee adequate information on which to base his decision. Thirdly, it is only via interviews that individuals who intend to use the PAP as a temporary source of income in lean times and those who have an inadequate idea about unions and their demands can be either weeded out or informed. Finally, interviews are essential to the appropriate tracking of an individual into the type of union(s) for which he is best suited. This last type of tracking (as opposed to academic tracking mentioned above) is necessary both for improving taining in the PAP as well as lowering loss rates once trainees are placed in a union program. Both these points are elaborated below.

TRAINING

Insofar as coaching for the GED (high school equivalency certificate) there is no substantial differenece between the PAP and the union training program. (Operation Dig does not offer this service). Assuming that there are similar

pressures and constraints placed upon trainees working for their GED, there is little that can be said about improving the curricula by comparing the effectiveness of the three organizations. It is the curriculum for the trainee who is in the program for some remedial education and coaching that maximally differentiates the three schools. Since we have no definitive data on this subject, we will proceed on the assumption that the organization with the better placement record has the best curriculum. Using this criterion we base our recommendations on the curriculum followed by Operation Dig. (see Chapter 2 for a description of the curriculum followd by Operation Dig and Appendix A, Table 4 for the percent successfully placed from the PAP.) Accordingly, the ideal type of training appears to be that geared specifically towards union entrance tests. Since these tests vary widely in the standards required, this coaching should be union specific. For example, while the Carpenters, the Ironworkers and the Sheetmetal workers (to name a few) have their own tests, the Carpenter's test is reported to be by far the most mathematically oriented.[1] Even for those unions which do not use their own tests but rely on the standard achievement test given by the Pennsylvania Bureau of Employment Security (see Chapter 3) union specific training seems to be desirable. The reason is that different unions attach different weights to the scores on different sections of the test. Tailor-made curricula are possible only with an intimate knowledge of these tests. While we have no specific information on them, it appears that most of the teachers are aware of the standards required for most tests and thus a curriculum designed in consultation with them would meet the above criteria.

By the very nature of the average PAP trainee (young, inexperienced, etc.) they generally do not have enough information to evalutate their interests and desires vis a vis specific unions. It would therefore seem that a brief but thorough orientation session(s) conducted by those best qualified (say a field supervisor working with that union or a minority placement who is a journeyman in that union) would be very useful in this context. Such orientations would useful to both the Plan and the trainee. The latter, in light of his experience in the PAP, can make a more intelligent decision about the construction industry in general and a union in particular. The Plan is also better able to track individuals which, as was discussed above, would be beneficial.

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[1] Interviews with teaching staff, follow-up counselors and some placements at Operation Dig and OIC.

The final component of training ought to be a system designed to coach trainees in interviews and interview technique. Most of these trainees are both young and inexperienced and hence have not had much experience with being interviewed. A simple system to do this would involve a series of mock-interviews with Plan staff (such as follow-up counselores) and minorities who have already been placed with feedback from the mock-interview committee. This simple system ought to be adequate and inexpensive.

It is the individual who is being prepared for the GED who ultimately receives the least amount of union specific training. But for a small percentage who receive their GED within the first few months of training, they are (because of six months time constraint) currently unable to utilize the little union specific coaching that is already available; and, there appears to be little opportunity for them to do so in the future. One is thus led to believe that these trainees either be given a longer period in which to adequately complete both sets of courses, or that the program be denied to those who require their GED before being able to use the more specialized and more useful aspects of training.[1] Operation Dig, which currently does not accept individuals without high school equivalence, has the best success rate at both the PAP level and union placements level. This suggests in the absence of other evidence, that it is the latter course of action that is preferable. It may be possible to provide the support required by such individuals to obtain their GED outside the PAP and then allow them to enter the regular training program.

FOLLOW-UP

Currently there is no follow-up of PAP trainees after termination. Analyses of success (see Chapter 4) and the following table indicates that once the individual leaves the program without being placed in a union training program there is only a very small probability of that he will ever enter a union. Assuming that the success rate for those who leave will be roughly the same as for those who do not leave the system, it is clear that a system should be devised to increase the percentage of placements by increasing the percentage of those who take union tests (or interviews).

One of the main reasons given to us (by Plan Staff) for the poor turnout for union tests was that their mass-mailing system of contacting individuals

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[1] Note that a GED is only a minimum requirement for placement.

TABLE 30 Trainee Status Upon Termination From PAP - Related to Placement Probability (Percentage in each category)

Successful completion of PAP:	Schedule for More Training	Job in Union	Other Job	Unemployed	Unknown
Yes	67	76	45	55	28
No	33	24	55	45	72
	100	100	100	100	100
Placed in Union Training Program:					
Yes	67	71	11	15	14
No	33	29	89	85	86
	100	100	100	100	100

when a union position opens up fails because of the large number of people who change their address. Our experience in administering the survey instrument confirms this. It therefore follows that if a simple system of keeping track of individual were instituted, there would be a far greater turnout for union tests. This can become a very critical issue since we have been told that there have been occasions when the Pittsburgh Plan was unable to muster as many individuals as there were slots allocated to the Plan. Because of the high failure case in the union screening process (approximately 60%) if the turn for a test is less than 1.67 times the number of slots available, they are automatically lost. This undermines the placement process of the Plan.

This follow-up system should maintain at least monthly contact with trainees. This contact can be over the phone since the information desired is only the current address and job status of the individual. The latter piece of information may be useful if the Pittsburgh Plan actively pursues other job placements and thus further contact with an individual placed in other jobs would not be cost effective.[1]

[1] By recruiting their other job placements for union placements, the Pittsburgh Plan would be undercutting one dimension of its operations to aid another. In addition, given the small number of job placements it is doubtful if the additional expense involved in tracking, recruiting and processing these people will be useful. If however, they express an interest in leaving their current positions for union placement, it is not unreasonable to assume that they would maintain contact with the Plan especially if specifically asked to do so. In sum, therefore, there appears to be no need to follow-up on job placements.

OTHER JOB PLACEMENTS

Currently the Plan is a one-dimensional organization (its goals and monies are directed only at placing individuals in union training programs). Considering the very low ratio of PAP placements to PAP trainees (.176) this uni-dimensional program reduces the overall effectiveness of the program measured from the perspective of benefits and costs. While there are a few trainees being placed in other jobs, the majority of these are credited to the Plan more by default rather than due to active placement. All three organizations claim that they indeed attempt to place their trainees in other jobs but, add that the lack of an overall program commitment to placement (implying a shortage of funds), seriously reduces the effectiveness of their efforts.

This change in program goals would, obviously, require additional funding or a simple reallocation of the budget. As the results of the transportation model show, this reallocation, if effectively carried out, will yield greater benefits to the Plan. This implies that additional funding would be more than adequately returned in additional benefits. The transportation model is discussed below.

TRANSPORTATION MODEL

The need for and usefulness of a transportation model in recruitment decisions was discussed in Chapter 9, page 138. In this part we discuss a model very similar to the one developed for placement recruitment with the input and output types redefined to conform with the PAP selection and recruitment problem.

The input populations were defined to be those called the unemployed and those called the underemployed.[1] The output categories were the following:

(1) union placement;
(2) non-union job placement (other job);
(3) chronic unemployment.

Variations in the model were developed since it was hypothesized that there would be different criteria by which to determine what is and is not optimal. Specifically three types of criterial were selected:

(1) the maximization of benefits given a certain budget under the constraint that all union slots be filled;

[1] The definition of these two types is presented in Appendix H.

(2) the maximization of benefits given a certain budget; however, there is no requirement that all union slots be filled; and,

(3) the minimization of costs given that all union slots are to be filled.

For complete details see Appendix G.

Since an infinite number of alternative solutions can be tried we present these runs for illustrative purposes only. In all these cases the budget constraint was set at \$1000[1] and a union slot constraint of 100 was assumed.

RUN 1

Objective: Maximize benefits subject to the condition that 100 union slots be filled.

Solution	Union	Other Job	Unemployed
Unemployed	76	98	363
Under-employed	24	20	62

Total benefits = 13,750; i.e., roughly a fifth of all selection was done from the under-employed type and all of the budget was used.

RUN 2

Objective: Maximize benefits subject to the condition that all union placements be less than or equal to 100 union slots.

Solution	Union	Other Job	Unemployed
Unemployed	92	119	440
Under-employed	0	0	0

Total benefits = 14,005; i.e., only the unemployed type is selected.

RUN 3

Objective: Minimize the toal cost under the condition that 100 union slots be filled.

Solution	Union	Other Job	Unemployed
Unemployed	0	0	0
Under-employed	100	83	255

Cost = 8,926; i.e., only the under-employed type is selected.

RUN 4

Objective: This run tests for the effect of reallocating the budget so that a follow-up procedure and an active job placement procedure could be instituted. All costs are increased by \$0.1 and the budget is retained at \$1000. Further, the effect of these changes in the program is assumed to result in a 10% change for the better in the transition probabilities for

[1] All dollar amounts are in thousands.

both input types to placements and other jobs. The objective was to maximize benefits such that 100 union slots were filled.

Solution	Union	Other Job	Unemployed
Unemployed	100	179	306
Under-employed	0	0	0

Total Benefits = 18,053; i.e., only the unemployed type is selected.

As the results indicate, under a given set of conditions, different objectives yield different answers. Varying the parameters of the model will, in general, yield different results. In the case of this model, as long as the transition probabilities are unchanged (or changed similarly) the general types of solutions shown above will hold true. That is, given a budget and slot constrint, the solution if feasible, will generally show the same pattern for each of the above objectives.

Thus using this model any policy decision whose effect can be translated into changes in the parameters of the model, can be evaluated. In conclusion one interesting feature of this model[1] is that it allows one to estimate the cost (or theloss in benefits) of a particular policy. For example, the additional cost of affirmative action is $14,005 - $13,750 = $255.[2] With no additional budget RUN 4 indicates that by appropriate reallocation of resources benefits can be increased by $4,048.

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[1] Technically all three cases are different models. It is however, convenient to consider them to be the same model being exercised from different perspectives.

[2] The conditions that all slots must be filled is equivalent to affirmative action.

CHAPTER 11
TECHNICAL ASSISTANCE

MANAGEMENT INFORMATION SYSTEM (MIS)

The quick pace of change, coupled with the singular characteristics of any manpower training program, places great demands on the speed and efficiency of management decisions. A fundamental input into these decisions is adequate information. The information must be concise, relevant, and speedily available.

It had become clear to the Research Team, through discussions with the Pittsburgh Plan management, as well as through our first-hand experience in data gathering, collating, and analyses, that there was a significant need for some efficient, flexible, and fast information system. In keeping with the goals of studying the Pittsburgh Plan which include providing technical assistance to its management, the Team has designed and tested a demonstration management information system (MIS).

Preliminary investigations revealed three key problem areas in information flow and analysis. First was information retrieval and routine record maintenance. Second was the method of recording monthly follow-up information on persons placed. Finally, there were problems with preparation and presentation of relevant statistics on the progress toward journeyman's status of individuals placed by the Pittsburgh Plan. These problem areas became the focus of the information system. Another critical factor in the design of the system that the day-to-day user would be a person generally unfamiliar with the use of computers. Keeping in mind these factors, a conversational, interactive information system was designed. The constraints of machine usage and storage space are considerable and were also kept in mind throughout the design phase.

The computer used was the IBM 360 installation at Carnegie-Mellon University using the Time Sharing System (TSS) - Version 8.1. The programming language was FORTRAN on TSS. The system has a series of subroutines callable from either the main program or other subprograms. (See Appendix I for a User Manual and sample runs.) This modular design provides for the flexibility inherently desirable in such systems. Thus, if the management of the Plan desires information as yet unavailable on the system, the required modifications are made in only one subroutine or through the addition of a new subroutine.

Due to user sophistication restriction, the programs are quite long. The interactive nature of the system coupled with the need for detailed questions to be asked by the system forces the system to be slower. However, this lack of speed is mainly an Input/Output (I/O) feature. The construction of special file structures and file addressing systems has resulted in a significantly fast and efficient system.

To accommodate the fast turnover rate of the participants of the Plan with the resulting variation in total length of stay, a linked list structure has been developed. The special advantage of this file structure is that there is no undue memory space usage, and, it can theoretically accommodate all the information that might be generated for one individual in his stay in a union training program. The operation of this linked structure may be more easily understood in the following diagram:

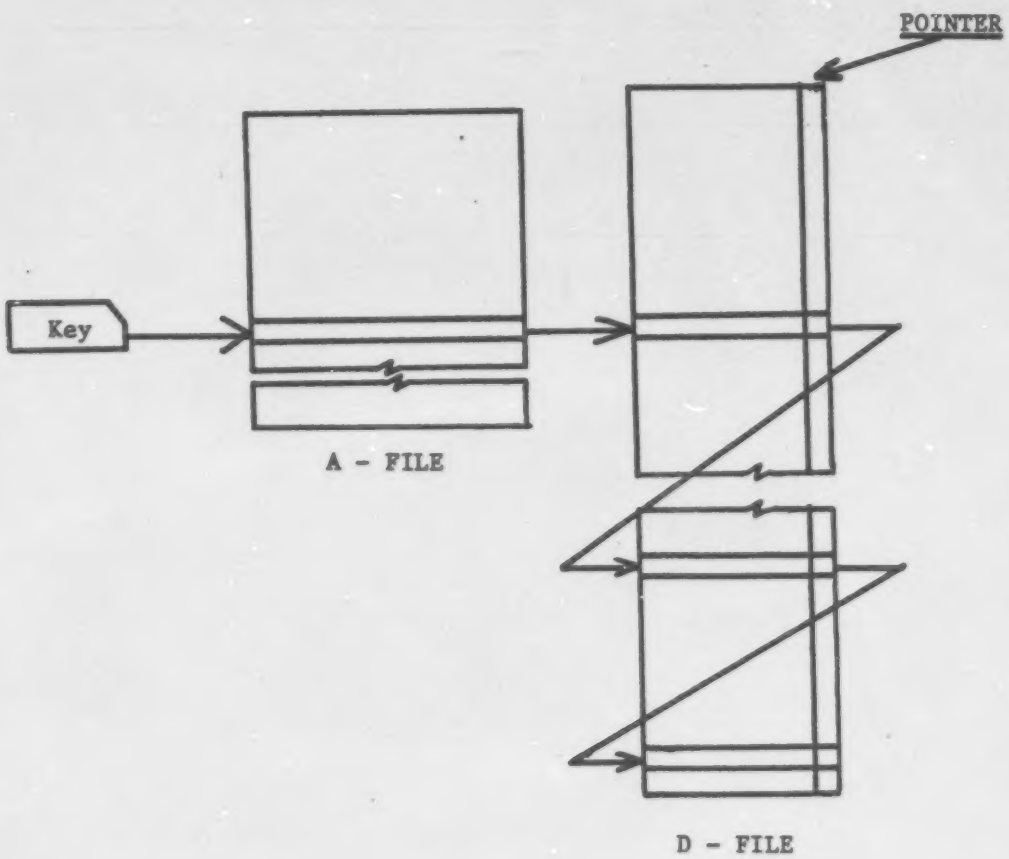

Figure 20 File Structures of the MIS.

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The MIS is currently designed to use, as the addressing key, the unique identification number assigned by the training organization to each participant. In addition to regular record maintenance facilities, such as editing, updating, inserting, and deleting records, the system permits easy and fast retrieval of information on any desired individual through efficient use of the addressing key. Standard information on an individual, such as address, phone number, and trade may be retrieved. One may also obtain the current status in the labor force of the individual placement or the change in status of this individual as a function of length of service.

At an aggregate level, data may be manipulated to show the status of all placements as of a particular date. In addition, this information can be broken down by trade, organization (Bidwell, DIG, OIC), classification (OJT or pre-apprentice), contractor, job sites, counselors. Further, modifications for improved format and easier use by the management of the Pittsburgh Plan were implemented.

In addition to such classifications, it is possible to obtain group reports on all or a subset of the individuals currently in the Plan. These reports may be detailed listings of the individual's personal data or listings of a specific month's follow-up information gathered by follow-up counselors. This latter type of listing is, in fact, similar to that put out by the Pittsburgh Plan every month. Further extensions of this facility are possible to permit classification by date of birth (age), date of placement, and phone number (using the first three digits of the phone number as an approximation to the geographic location of individuals). It would also be possible to provide a two-way classification facility. This would vastly increase the power of the system. Thus, one would be able to obtain certain specified information on those individuals who share one specified characteristic and/or another specified characteristic.

Finally, a Users Manual was written to be used as the basic operating text for the system. Appendix I contains a copy of this manual, and in addition, a copy of a typical remote terminal session with the system and a few samples of output are presented. It may be mentioned that some of the output may be printed on a high speed line printer thus saving considerable Input/Output time at the user end. This also permits the printing of several copies of the same report for distribution - a necessary feature given the many components that make up the Pittsburgh Plan.

Implementation

Despite the quite positive reaction of the users to the demonstration of the MIS, a variety of problems arose resulting in the temporary abandonment of the implementation of the System. One of the reasons was the expansions desired by the user organizations. If these expansions and extensions were incorporated into the System, the Carnegie-Mellon University computer would have been unable to handle the increased work load with ease. This was because though large by most standards, the Carnegie-Mellon computer is also very heavily used. Further, the reliability of the computer is not of the highest order (while the MIS was designed with the idea of its transfer to another computing system, no alternative system was found). The combination of the above reasons implied that if the MIS were to be on the Carnegie-Mellon University system it would not, given the required initial outlay on hardware, prove to be cost-effective.

Quite apart from the question of whether the MIS were cost-effective or not, there lay the problem of direct dollar costs itself. The costs facing the users were data base creation costs, the cost of obtaining, installing and maintaining the hardware (remote terminal and associated accessories) and the personnel costs. Faced with these costs and their own uncertain and inadequate funding, the users seemingly decided to hold off for the present, presumably awaiting either better or more stable funding.

In light of this, it was decided to drop the idea of the immediate implementation of the System. Despite the lack of an operating system, we feel that the effort has already paid off. It not only expanded our knowledge of the information flow in the Pittsburgh Plan but also let us spot a few of the bottlenecks in the flow pattern. On the other side, the user organizations have been brought into contact with some of the newer tools of management. As has been often said, while decentralization is inherently attractive, the associated costs arising from lack of adequate control and planning generally seem to offset the advantages of decentralized service organizations. This effort has already revealed to both us and the user organizations the tremendous advantage of having and using a central computer based information system. This system would permit decentralized neighborhood based service organizations and yet, with fast and accurate information flow, permit rational and adequate control and planning. That is, given such a system, we can have a viable group of such local service centers monitored and controlled by one central organization.

The MIS may also prove valuable for future research efforts. It will insure that information on each participant is organized according to a structured format so that data needed to model participants' success will be easily accessible. It will also allow quick aggregation and disaggregation of data which may then be analyzed in terms of particular trades, contractors, age groups. or training organizations.

OTHER TECHNICAL ASSISTANCE

Throughout the length of this study the Research Team has maintained close ties with the three organizations and the Co-Ordinator's Office. As part of the research every care was taken to inform them about the latest findings and recommendations based upon those findings.

The extent of the implementation is not clear especially since the Pittsburgh Plan has been in a very high state of flux in the past months - a period during which our most significant findings were reached. Once the final draft of this report is approved, a one-day seminar is planned at which our findings and recommendations, both general and specific will be discussed. Hopefully, this will result in some changes for the better in the overall effectiveness of the Pittsburgh Plan.

Based upon our experience with information collection and processing, especially in the context of the MIS, changes in the system of record maintenance were suggested. Currently we are not in a position to evaluate the extent to which these suggestions have been incorporated.

SUMMARY

Discussions with various levels of the management of the Pittsburgh Plan and our own experience with collecting and analysing pertinent data led to the designing and testing of a Management Information System. The System was interactive and was designed both for efficient operation as well as easy modifications. Despite the initial interest displayed by Plan personnel financial considerations have prevented the implementation and operationilization of the System. However, the effort is considered to have been worthwhile because of the insights provided to the Research Team as well as the Plan management.

Other information such as results of analyses and recommendations deduced from them were given to Pittsburgh Plan staff throughout the period of the Study. However, the extent of implementation remains in doubt. Upon approval of this report, an extensive seminar is planned to acquaint, formally, the Staff with its contents.

APPENDIX A

MA-101, MA-102 DATA

In the Pittsburgh Plan, every person who is recruited or contacted fills out a Fact Sheet. This Fact Sheet contains very little information. However, upon nomination to the Pre-apprentice Program the individual, with the recruiter, fills out a Department of Labor form MA-101. Figure 1 is a copy of this form. As can be seen, it contains a variety of demographic type of information with a few questions pertaining to the type of referral and barriers to employment. Upon termination from the PAP Department of Labor form MA-102 is filled out for the individual a copy of which is Figure 2. This form contains information on the persons attendance, the type of termination, the reason(s) for termination and the status immediately after termination.

Our main sources for these data were the three organizations. However, it happened that most (over 70%) of these data for individuals eventually placed in a union training program were not available at the organizations and were obtained from the Pittsburgh Plan Co-ordinator's office. Since the Co-ordinator's office gave us MA-101 and MA-102 forms on virtually everyone who had been placed from the PAP our data is biased in favor of placements. However, a random sample taken so as to eliminate the overrepresentation of placements did not indicate any major bias in the mean values of the variables.

The result of this data collection effort was over 1100 forms MA-101 and over 800 forms M-102. The period covered by them was approximately from 1972 to mid-1975. We did not obtain any data after that date because of two reasons: the Plan had stopped using these forms around the same time; and a final cut-off date was fixed for the end of 1975. It was felt that the effort required for obtaining data for the rest of '75 from different forms and all the adjustments that required was not worth the re-run.

Using social security numbers as the key, the two sets of data were matched to find 776 non-duplicated matches between forms MA-101 and MA-102. Upon investigation it appeared that this lack of adequate matching was the result of poor record maintenance at the three organizations. In any event, 14 variables from form MA-101 and 5 variables from from MA-102 were coded and keypunched into machine useable form. The remaining variables were not collected for one or more of the following reasons:

a. there was very little variance in the responses (e.g., DISADVANTAGED item #38 MA-101)

Figure 1 Form MA-101

U. S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION
Form MA-101 (6-68)

☆U. S. GOVERNMENT PRINTING OFFICE: 1968 — 311-048

FORM APPROVED
BUDGET BUREAU NO. 44 R1202.2

APPLICANT INFORMATION RECORD

1. CONTRACT IDENTIFICATION
a. State of Training
b. State Code | c. Fiscal year approved
d. Contract No. (Prefix) (Prime) (Sub)

2. FUNDING CODE

a	b
A__CEP	A__MDTA
B__Model City	B__EOA
C__CWTP	C__Social Security
__Other (Specify)	__Other (Specify)

3. PROGRAM IDENTIFICATION
01__MDTA-Institutional
03__MDTA-OJT
05__MDTA-Coupled
07__MDTA-Part-time
11__NYC-In school
13__NYC-Out of school
15__NYC-Summer
21__New Careers
23__Operation Mainstream
25__Orientation
27__Special Impact
__Other (Specify)

4. MDTA INSTITUTIONAL SEC. NO.

5. WIN ONLY
1__ES 2__CAA 3__Other

6. LOCAL ES OFFICE NO.

7a. NAME OF CONTRACTOR

7b. ADDRESS (Number, Street, City, State, and Zip Code)

8a. OCCUPATIONAL GOAL (Name)

8b. DOT (9 digit)

9a. TARGET AREA (Name)

9b. CODE

10. START DATE (Mo., day, yr.)

11a. NAME OF APPLICANT (Last, first, middle initial)

11b. PHONE NO.

11c. SOCIAL SECURITY NO.

12. ADDRESS (Number, Street, City, State, and Zip Code)

13. COUNTY OF RESIDENCE a. Name | b. Code

14. CONGRESSIONAL DIST. a. State Code | b. District No.

15. DATE OF BIRTH (Mo. & yr.)

16. SEX
1__Male
2__Female

17. HANDICAPPED
1__Yes
2__No

18. MILITARY SERVICE STATUS
1__Veteran
2__Rejectee
3__Other non-vet
Discharge Date (Month, day, & year)

19. MARITAL STATUS
1__Never married
2__Married
3__Widow / Widower
4__Divorced / legally separated

20. PRIMARY WAGE EARNER
1__Yes
2__No

21. HEAD OF FAMILY OR HEAD OF HOUSEHOLD
1__Yes
2__No

22. NO. OF DEPENDENTS
0__ 4__
1__ 5__
2__ 6 and __ over
3__

23. CHECK ONE
1__White
2__Negro
3__Amer. Indian
4__Oriental
5__Other

24. IF SPANISH SURNAME, CHECK ONE
1__Mexican American
2__Puerto Rican
3__Other

25. U. I. CLAIMANT
1__Yes
2__No
3__Exhaustee

26. PUBLIC ASSIST. RECIPIENT
1__Yes 2__No
If YES, fill out reverse side

27. HIGHEST SCHOOL GRADE COMPLETED

28. PREVIOUS JOB TRAINING
1__Yes (If YES, complete the information below)
2__No
a. Job Title
b. DOT (6-digit) | c. Date completed (Mo. & yr.)

29. PARTICIPATION IN OTHER FEDERAL PROGRAMS
9__None
Participated in (check all relevant items)
a1__MDTA
2__NYC
4__Project Transition
b1__Operation Mainstream
2__Special Impact
4__Work Incentive
c1__Job Corps I
2__Job Corps II
4__Job Corps III
d1__New Careers
2__Other

30a. PRIMARY OCCUPATION TITLE (if any)

30b. DOT (9 digit)

31a. OCCUPATION TITLE OF LAST FULL-TIME CIVILIAN JOB

31b. DOT (9 digit)

32. YEARS OF GAINFUL EMPLOYMENT
1__Under 1 year
2__1-2 years
3__3-9 years
4__10 years and over

33. ESTIMATED AVERAGE HOURLY EARNINGS ON LAST FULL-TIME CIVILIAN JOB
$_____

34. INCOME
a. Applicant's estimated earnings last 12 months $_____
b. Estimated family income last 12 months $_____
c. Number in family _____
d. Family below poverty level 1__Yes 2__No

35. LABOR FORCE STATUS AT TIME INTERVIEWED (Check only one)
11__Employed (not underemployed)
12__Underemployed
13__Unemployed
14__Family farm worker
21__Not in labor force - in school
22__Not in labor force - other

36. WEEKS UNEMPLOYED
____Last 12 Mos. (all applicants)
____Current spell (Unemployed only)

37. REFERRED BY
01__ES Outreach
02__NYC
03__Job Corps
04__Union
05__Employer
06__Self
07__Welfare
08__Other community group
11__Coop School Graduate
12__Coop School Dropout
21__Sel. Service Rehab. (Recruiting Station)
22__Sel. Service Rehab. (AFEES)
23__Sel. Service Rehab. (Local Board)
31__Other

38. DISADVANTAGED
1__Yes
2__No

39. REFERRAL TO TRAINING OR EMPLOYMENT

a. Accepted referral to training or job	b. Enrolled in training	c. Placed in job
1__Yes	1__Yes	1__Yes
2__No	2__No	2__No

40. ELIGIBILITY FOR TRAINING ALLOWANCE
9__Not eligible
Eligible for:
1__Regular
2__Augmented
3__Youth
4__Special NYC
5__Incentive
6__Part-time

41. CHECK APPROPRIATE ITEM(S) IF ELIGIBLE FOR OTHER ALLOW.
1__Subsistence
2__Transportation
3__Other

42. BARRIERS TO EMPLOYMENT
9__None
a1__Age - too young
2__Age - too old
4__Lacks education, training skill, experience, or has obsolete skill
b1__Health problem
2__Personal problem
4__Transportation problem
c1__Child care problem
2__Care of other family member
4__Conviction record
d1__Garnishment
2__Other

43. DATE OF INTERVIEW (Month, day, & year)

Figure 1 Contd.

Form MA-101 (6-68)

APPLICANT INFORMATION RECORD SUPPLEMENT

PART A - ALL PUBLIC ASSISTANCE RECIPIENTS

1. FINANCIAL AID RECEIVED
   - 1__APTD
   - 2__AFDC
   - 3__OAA
   - 4__AABD
   - 5__General Assistance
   - 6__AFDC and General Assistance
   - 9__Other

2. RESIDES IN PUBLIC HOUSING 1__Yes 2__No

3. PARTICIPATED IN CWT AND /OR TITLE V
   - 1__CWT
   - 2__Title V
   - 3__Both CWT and Title V
   - 4__Neither

4. NUMBER OF DEPENDENTS BY AGE AND ARRANGEMENT MADE FOR THEIR CARE

	1. Under 6 yrs.	2. 6-15 yrs.	3. 16-21 yrs.	4. 22-64 yrs.	5. 65 yrs. & over
a. Number of dependents					
b. Number for whom care is needed					

5. FOR YOUTH ONLY —APPLICANT LIVES WITH
   - 1__Both parents
   - 2__Father
   - 3__Mother
   - 4__Guardian
   - 5__Other

PART B - WIN APPLICANTS ONLY

6. REFERRAL CATEGORY

7. AMOUNT OF WELFARE CASH ASSISTANCE TO FAMILY FOR MONTH PRIOR TO REFERRAL $_____

8. OTHER FAMILY MEMBER ALREADY IN WIN 1__Yes 2__No

9. SEASONAL AGRICULTURAL WORKER APPROVED FOR AFDC IN LAST 5 YEARS 1__Yes 2__No

10. LENGTH OF TIME ON AFDC

	Years	Months
a. Total time during last five years		
b. Consecutive time since most recent approval of AFDC		

11. COMMENTS

SIGNATURE OF INTERVIEWER

TITLE | DATE

PART C - SERVICES PROVIDED

1. EMPLOYABILITY PLAN INVOLVES (Check one or more kinds of assistance needed)
   - __a. Counseling
   - __b. Orientation
   - __c. Training
   - __d. Relocation

   Supportive Service:
   - __e. Health
   - __f. Rehabilitation
   - __g. Welfare
   - __h. Other

2. FAMILY INCOME GROUP __a. Farm __b. Non-farm

3. PARTICIPANT OF PROJECT 100,000 (As specified on Form YES-1) __a. Yes __b. No

4. SERVICES PROVIDED

TYPE OF SERVICE	DOT CODE (6 digit)	SIC (2 digit)	DATE
a. COUNSELING INTERVIEWS			
b. COUNSELING SESSIONS			
c. GUIDANCE SESSIONS			
d. JOB DEVELOPMENT CONTACT			
e. PLACEMENT IN JOB 3 DAYS OR LESS			
f. PLACEMENT IN REGULAR JOB			
g. APPLICANT-EMPLOYER INTERVIEW			
h. SPECIAL PLACEMENT			
i. REFERRED TO SUPPORTIVE SERVICE (1) HEALTH			
(2) REHABILITATION			
(3) WELFARE			
(4) OTHER			
j. FOLLOWUP CONTACT			
k. OTHER (specify)			

5. TRAINING REFERRALS AND ENROLLMENTS

TYPE OF TRAINING	DATE REFERRED	DATE ENROLLED
a. MDTA - INSTITUTIONAL		
b. NYC		
c. NYC - MDTA CONCURRENT		
d. JOB CORPS		
e. OPERATION MAINSTREAM		
f. NEW CAREERS		
g. SPECIAL IMPACT		
h. RETURN TO SCHOOL		
i. OTHER		

Form OE-874 (5/71)
O/E - O/HEW
Form MA-102 (8-69)

Figure 2 Form MA-102

INDIVIDUAL TERMINATION/TRANSFER REPORT

Form Approved
Budget Bureau No. 44-R1204

1. NAME OF TRAINING FACILITY/CONTRACTOR

2. ADDRESS (Number, Street, City, State, and Zip Code)

3. Soc. Sec. No.

4. NAME OF TRAINEE

5. ADDRESS (Number, Street, City, State, and Zip Code)

6. CONTRACT (PROJECT) IDENTIFICATION
a. Name of State
b. State Code
c. Fiscal year approved
d. Contract No. (Prefix) (Prime) (Sub)
e. Soc. Sec. No.

7. PROGRAM IDENTIFICATION

01	MDTA-Inst	21	New Careers
03	MDTA-OJT	23	Operation Main.
05	MDTA-Coupled	41	Other (Specify)
07	MDTA Part-time		
11	NYC In School		
13	NYC Out/School		
15	NYC Summer		

8. ATTENDANCE (Mo., day, yr.)
a. First day
b. Last day

9. NO. OF CLASS DAYS
a. Attended
b. Missed

10. CLOCK HOURS ATTENDED

11. LAST SERVICE OR TRAINING COVERED BY THIS REPORT

12. WORK ASSIGNMENT (Omit for MDTA)
1 Assignment
2 Location

13. TRAINING PHASE (For all relevant training)

		Clock Hrs.
01	Occupational	
02	Basic Education	
04	Pre-Vocational	
08	Emp. Skill/Orientation	
16	Other (Specify)	

14. SERVICES RENDERED (Omit for MDTA)

9	None
1	Counseling _____ No. of Clock Hrs.
2	Testing _____ No. of Clock Hrs.
01	Medical Examination
02	Medical Service
04	Dental Examination
08	Dental Service

15. NATURE OF TERMINATION

COMPLETED TRAINING OBJECTIVE	1	Full Course
	2	Early Completion
	3	Accepted Full-time Job
DID NOT ACHIEVE TRAINING OBJECTIVE	4	Involuntarily dropped
	5	Voluntarily dropped
	6	Transferred to other MDTA training

16. REASON DROPPED (If voluntarily or involuntarily dropped, check the ONE most important reason below.)

01	Moved from area	05	Pregnancy of trainee	09	Lack of progress or interest	13	Quit school (Omit for MDTA)
02	Returned to school	06	Alcoholism, drugs	10	Poor attendance	14	Agreement terminated (Omit for MDTA)
03	Entered Armed Forces	07	Care of family	11	Misconduct	15	Unknown
04	Illness of Trainee	08	Died	12	Became ineligible (Omit for MDTA)	16	Other (Specify)

17. STATUS AT TIME OF TERMINATION (Complete A or B for all trainees)

A. Working or Scheduled to Report to		B. Not Scheduled to Report to a Job, But:			C. Primary Workstation (Omit for MDTA)		
1 Training related job	3 Looking for work	5 Scheduled for more trng.	(1) Is trainee at previous workstation		(2) Employer is:	
2 Non-training related job	4 Not looking for work	6 Not known	1 Yes	2 No	1 Public	2 Private, nonprofit	3 Private, for profit

EMPLOYER'S NAME AND ADDRESS

18. CERTIFICATION BY TRAINING FACILITY (FOR MDTA Trainees only)
This is to certify that the circumstances of termination for the trainee to whom this report refers are
1 For Good Cause 2 Not for Good Cause (Complete item 19)

a. FACILITY NAME AND ADDRESS

b. NAME AND TITLE OF AUTHORIZED OFFICIAL

c. SIGNATURE

d. DATE

19. REVIEW BY FACILITY OR DEPARTMENT HEAD (Complete for MDTA trainee if termination was Not for good cause; all other programs for each trainee.)
I have reviewed the circumstances surrounding the termination of the Trainee to which this report refers and have found them to be accurately described.

a. AGENCY NAME AND ADDRESS

b. NAME AND TITLE OF AUTHORIZED OFFICIAL

c. SIGNATURE

d. DATE

FOR USE BY SELECTION/REFERRAL OFFICE OR SPONSOR

20. ARE ALL PHASES OF TRAINING OR SERVICES TERMINATED IN THIS PROGRAM?
1 YES (If "Yes," enter 9-digit DOT Code for occupation listed in item 11) DOT CODE
2 NO

COMPLETE BELOW IF ANY ADDITIONAL OR CONTINUING ACTIVITY IS SCHEDULED

21. PROGRAM IDENTIFICATION (Enter code from item 7 above or check applicable program)

	Program Identification Code		
27	Special Impact	37	Upward Bound
29	Job Corps	43	Other (Specify)
31	CEP		
33	WIN		
35	OIC		

Complete for MDTA Programs only

22. MDTA CONTRACT (PROJECT) IDENTIFICATION
a. State Name
b. State Code
c. FY Approved
c. Contract No. Prefix Prime Sub
e. Soc. Sec. No.

23. OCCUPATION

24. DOT CODE

25. IS TRAINEE ENROLLED IN ADDITIONAL ACTIVITY?
1 Yes
2 No (If "No," enter reason code from item 16 above)

26. REASON CODE

STATE NAME AND CODE

OFFICE OR AGREEMENT NUMBER

DATE

b. they were hypothesized a priori, to be insignificant for analysing success or failure (e.g., SOURCE OF REFERRAL. Item MA-101)

c. the information was similar or/and identical to information from other variables.

In order to better interpret the results of any analysis that we might perform, these variables were recoded.

The final step in processing this data lay in the handling of missing observations. It was determined that the maximum allowable percentage of missing values was 5%. Fortunately all variables chosen were under this cut-off point. It was decided to replace missing observations with the means of the variable computed over the remaining observations. Since one important dimension of our analyses lay in the differences among the three organizations and their input populations, the means used to replace missing observations were computed using only observations within each organization. Succeeding work has to some degree justified this action. However, it could be argued that a better breakdown may have been between those placed and not placed or between those who terminated successfully or unsuccessfully from PAP. Since a decision had to be made early on, all subsequent analyses use data with missing values computed as above.

The result of the above process was a dataset containing 776 observations on original or recoded variables and computed variables. The following tables contain some figures comparing some important percentages with the best available percentages for the population.

Table 1

NUMBER OF OBSERVATIONS PER ORGANIZATION

	BIDWELL	DIG	OIC	TOTAL
DATA	291 (37.5)	299 (38.5)	186 (24.0%)	776 (100%)
REPORTED*	459 (32.1)	490 (34.3)	481 (33.6)	1430 (100%)

*Computed from data reported by the Pittsburgh Plan Co-ordinator's Office.

Table 2

PERCENTAGE SUCCESFUL-DEFINITION 1.a PER ORGANIZATION

	BIDWELL	DIG	OIC	TOTAL
DATA	4918	57.0	57.6	54.4
REPORTED		ESTIMATES NOT AVAILABLE		

Table 3

PERCENTAGE SUCCESSFUL - DEFINITION 1.b PER ORGANIZATION

	BIDWELL	DIG	OIC	TOTAL
DATA	63.2	76.6	66.7	69.2
REPORTED*	62.1	68.2	56.5	62.3

Table 4

PERCENTAGE PLACED PER ORGANIZATION

	BIDWELL	DIG	OIC	TOTAL
DATA	16.2	33.1	41.4	28.7
REPORTED*	10.24	24.29	17.88	17.6

The figures in Table 1 clearly indicate that in terms of representation in the dataset, OIC is underrepresented with BIDWELL and DIG being slightly over represented. Assume that the bias based on Definition 1.a is similar to the bias based on Definition 1.b. Then, in combination with the bias indicated by the percentage placed, it is clear that the data is grossly biased in favor of OIC against DIG. In addition, as seen in Tables 3 and 4, there is an overall bias towards the more successful with 69.2 as opposed to 62.3 successful by Definition 1.b and 28.7 as opposed to 17.6 percent placed in union training programs.

In order to estimate the direction and magnitude of these biases, various random samples were drawn in conformance with population percentages. In all cases almost all the mean values remained well within acceptable tolerance limits. It was therefore expected that the net effect of these biases would

*Computed from data reported by the Pittsburgh Plan Co-ordinator's Office.

be neglible. In face of this fact, it was felt desirable to maintain an adequately large sample size acknowledging the possible existence of undiscovered bias.

Below are the variables coded, recoded or estimated with the mnemonics used, a brief description, the means and standard deviations (when applicable) and, in parentheses, the percentage of missing values that were replaced by the means computed as above.

All A Priori Hypothesized Explanatory Variables

Mnemonic	Description
AGE	Age of trainee in years. Mean 23.86; s.d. 3.055. (0.6%)
MIL	Military status of the trainee coded to take a value of 1 if he is a veteran and 0 otherwise Mean 0.23; s.d. N.A. (1.5%)
MAR1	A binary variable for the marital status of the trainee taking a value of 1 if he was married and 0 otherwise Mean 0.1845; s.d.N.A. (0.0%)
MAR2	A binary variable taking a value of 1 if trainee was married and is now separated, divorced or widowed and 0 otherwise Mean 0.0480; s.d.N.A. (0.0%)
PWAG	A binary variable taking a value of 1 if the trainee was the primary wage earner in the household and 0 otherwise Mean 0.487; s.d. N.A. (0.13%)
HEAD	A binary variable taking a value of 1 if trainee was head of the household and 0 otherwise. Mean 0.4217; s.d. N.A. (0.25%)
DEPS	Number of dependents of trainee Mean 0.5943; s.d. 1.096. (0.39%)
WELF	A binary variable taking a value of 1 if the trainee was on public welfare at the time of enrollment and 0 otherwise. Mean 0.3502; s.d.N.A. (0.13%)
GRADE	Highest grade completed by individual, GED being considered equivalent to Grade 12 and 1 year of college 13 and so on. Mean 11.64; s.d. .958. (0.13)
LMISC	A binary variable taking a value of 1 if the trainee's last occupation type did not fit into any of the above categories 0 otherwise Mean 0.0108; s.d.N.A. (2.32%)

Mnemonic	Description
GAIN	Years of gainful employment of the trainees coded to take a value of 1 if trainee was employed gainfully for less than one year, 2 between 1-2 years, 3 between 3-9 years and 4 between 10 or more years Mean 1.979; s.d. 0.792. (1.0%)
LINC	Trainee's estimated total earnings in the year prior to enrollment in the pre-apprenticeship program Mean 1805, s.d. 1843 (1.93%)
LUN	Number of weeks the trainee had been unemployed in the year prior to enrollment in the preapprenticeship program Mean 28.94; s.d. 18.80 (2.32%)
DAYSATT	Number of days trainee attended in the training program Mean 79.098; s.d. 41.86. (0.52%)
WORK 1	A binary variable taking a value of 1 if the trainee was working in a non training job after termination and 0 otherwise Mean .1612; s.d.N.A. (0.52)
WORK 2	A binary variable taking a value of 1 if the trainee was working in training related job after termination and 0 otherwise Mean 0.2108; s.d.N.A. (0.52%)
PRJT	A binary variable taking a value of 1 if trainee has had any job training prior to enrollment and 0 otherwise Mean 0.1582; s.d.N.A. (4.64%)
FED	A binary variable taking a value of 1 if trainee had previously enrolled in any federal training program Mean 0.3136; s.d.N.A. (1.8%)
LCONSK	A binary variable taking a value of 1 if the trainee's last job before entering the program was in a skilled construction and 0 otherwise Mean 0.0318; s.d.N.A. (2.32%)
LGENSK	A binary variable taking a value of 1 if the trainee's last job before entering the program was a skilled but non-construction and 0 otherwise Mean 0.0911; s.d.N.A. (2.32%)
LGENUN	A binary variable taking a value of 1 if the trainee's last job before entering the program was unskilled but non-construction and 0 otherwise Mean 0.5689; s.d.N.A. (2.32%)
LWHITE	A binary variable for the type of the trainee's last occupation taking a value of 1 if he had been working on a white collar job and 0 otherwise Mean 0.1255;s.d.N.A. (2.32%)

Mnemonic	Description
TRG	A binary variable taking a value of 1 if trainee was slated for further training upon termination and 0 otherwise Mean 0.04664; s.d.N.A. (0.52%)
UNEMP	A binary variable taking a value of 1 if trainee was unemployed upon termination and 0 otherwise Mean 0.4356; s.d.N.A. (0.52%)
UNKN	A binary variable taking a value of 1 if status of trainee, upon termination was unknown, and 0 otherwise Mean 0.1457; s.d.N.A. ().52%)
BID	A binary variable taking a value of 1 if the trainee was enrolled in Bidwell's pre-apprenticeship program and 0 otherwise Mean 0.3750; s.d.N.A. (0%)
DIG	A binary variable taking a value of 1 if the trainee was enrolled in DIG's pre-apprenticeship program and 0 otherwise Mean 0.3853: s.d. N.A. (0%)
OIC	A binary variable taking a value of 1 if the trainee was enrolled in OIC's pre-apprenticeship program and 0 otherwise Mean .2397; s.d. N.A. (0%)
ABSPER	Percentage of days the trainee was absent based on his total length of service in the pre-apprenticeship training program Mean. 8.95; s.d. 11.42 (0.5%)
TBIN	A binary variable taking a value of 1 if the trainee was terminated successfully by Definition 1.a. and 0 otherwise Mean 0.5444; s.d. N.A. (0%)
ALTTBIN	A binary variable taking a value of 1 if the trainee was terminated successfully by Definition 1.b. and 0 otherwise Mean .692; s.d. N.A. (0%)
PBIN	A binary variable taking a value of 1 if the individual was placed in any union training program and 0 otherwise Mean .2874; s.d. N.A. (0%)
MULTABSDIG	A variable computed by multiplying DIG and ABSPER. Mean 2.266765; s.d. S.826 (0.52%)

APPENDIX B

SURVEY DATA

The questionnaire was intended to provide information concerning a number of areas of interest; its primary function is to provide follow-up information (post-placement experience) for a representative sample of minorities placed in the building trades unions through the Pittsburgh Plan. The questionnaire was directed to both those trainees who were still in union training programs (both apprentice and OJT) and individuals who had previously terminated from such training. The survey instruments are essentially the same, only slight modifications were made to accomodate responses from terminated trainees. A copy of the questionnaire is included on the following pages. The 21 pages of questions correspond to a maximum of approximately 165 responses per individual.

DEVELOPMENT OF THE QUESTIONNAIRE

A meeting of Plan placements at Operation Dig was used as a convenient testing ground for the questionnaire. The persons in attendance filled out a pilot questionnaire and were asked to provide feedback to the Research Team concerning the questionnaire design. The suggestions of this group were incorporated in the final questionnaire design. Unfortunately this test of the survey design appears to have been made in an unusually favorable environment. The trainees obviously felt compelled to answer the questions more completely than those in the actual survey and coliaborated to resolve those areas of the questioning which were most unclear. This apparently led to overestimates of the amount of information which could be gathered via the survey.

THE SURVEY RESPONSE

The questions break down into the following areas of inquiry for which the approximate overall response rates have been tabulated.

Question group	Number of questions	Average response rate*
personal/demographics	9	97
prior training	5	96
prior exposure to construction	3	98
previous employment/ earnings	14	94
pre-apprentice program		
participation	3	75
evaluation of	8	81
problems while in	4	82
helpfulness of	3	79
union tests, interviews	5	64
first union job	6	85
current union job	4	75
present employment status	7	83
preceptions of union employ	7	88
problems with union work attendance	9	77
employment and income in union	7	85
union classes		
evaluation of	6	86
problems with attendance	10	80

The responses were examined and placed in the following categories:

good	173
useful	14
useless	11
TOTAL	198

*Only considering the 173 "good" responses used in analyses.

Good responses were been identified by crosschecking and matching Plan records and questionnaire responses for social security number, date of birth and union affiliation. In addition the good responses were fairly complete and contain no apparent gross inconsistencies. Only the "good" returns have been used in the union success profile analysis and the economic analyses.

Useful responses have not been positively identified as being those of a particular Plan participant, but appear to be totally consistent with a knowledge of the Plan and the unions. These responses are used only in tabulation of answers to questions concerning subjective evaluation of pre-apprentice and union training, and problems with attendance.

Returns categorized as useless are those for which two responses were collected from the same individual or where response to questions was very low or revealed gross inconsistencies. These responses were used in no analyses.

Considering only the 173 good responses, used in the bulk of the analysis, the following presents a breakdown of the respondents.[1]

	QUIT	TERMINATED	JOURNEYMEN	ONBOARD(still in union training)
PAP	7	12	5	41
DIRECT	5	7	13	79

The total PAP respondents is 65; the total direct placed respondents is 108.

ADMINISTRATION OF THE FIELD SURVEY

The usual procedure employed in administering the field survey was to locate the residence of the placed trainee, leave the questionnaire and return to pick it up at some later time. Approximately 10% to 15% of the responses were collected in a different fashion with those handling the questionnaires actually administering them in person to the Plan placements. Other methods of distributing questionnaires were mailing and having union personnel distribute them directly to the trainees.

[1] Status as of December 31, 1975.

With the aid of hindsight it is now clear that the design of the questionnaire was overly ambitious in its scope and length. Although among the 173 "good" returns the overall response rate is surprisingly high, many of the critical questions for the proposed extended profile analysis (beyond demographics) received a response which prevented them from being included in the desired rigorous statistical analyses. Several possible explanations have been advanced by the Research Team: a lack of incentive for trainees to respond (although payments to trainees to return the questionnaire was tried with no dramatic increase in success), a desire to retain some privacy by not responding to specific questions and confusion as to the response expected. This last explanation appeared to be significant as some questions (especially those relating to employment prior to program entry and those concerning employment and earnings in the unions) would appear to require some degree of interpretation by the respondent.

The length and complexity of the questionnaire certainly posed serious problems in obtaining an adequate number of responses and also possibly in obtaining thoughtful responses to questions which were highly subjective in nature. At first glance the 21 pages of rather complex questioning is certainly formidable. Interviews with Plan staff indicate that many trainees, even after PAP training, have considerable reading difficulties. This suggests that a more simply stated and straightforward questionnaire might both have been received more favorably and received a more consistently accurate response. It also seems likely that a significant number of trainees who might have returned sincere and thoughtful replies to a short questionnaire quit after a few pages of questions and did not return it.

Undoubtedly the greatest obstacle faced by the Research Team in obatining adequate response to field survey was simply in locating people. The Plan placements are apparently a very mobile population and not inclined to be receptive to attempts by unknown persons to ascertain their whereabouts. Of course this problem is not unique, having been reported by many groups attempting to gather follow-up data on training program participants. As an indication of the difficulties encountered, the following breakdown of survey results from late in the survey effort shows that no information was available for the majority of the placements (classified as unknown).

Status of survey effort	Number of placements
received questionnaire	198
unknown	420
wrong address	116
all other reasons for no response	74

POSSIBLE BIASES WITHIN THE SAMPLE SURVEY

Some bias is to be expected in conducting such a survey, both because of the particular subsets of participants who are contacted, and within the contacted group, because of the particular subset which returns usable responses Cain and Hollister discuss the problems associated with such surveys, "The major obstacle to follow-up measures is the difficulty in locating people, particularly those from disadvantaged populations who may be less responsive and who have irregular living patterns. The biases due to nonresponse may be severe, since those participants who are easiest to locate are likely to be the most "successful", both because of their apparent stability and because those who have "failed" may well be less responsive to requests to reveal their status."[1]

SURVEY DATA USED IN THE LOGIT ANALYSIS OF TRAINEE SUCDESS AND IN PLACEMENTS-DESCRIPTION

The variables listed below were used in the success profile of journeymen. Due to the number of missing values for some variables the number of observations was reduced from 173 to 155 in order to reduce the number of missing values for all variables to below 5 percent. Percent missing values for the entire set of 173 observations is shown in parentheses.

AGE	trainee age Mean 30.81 std. dev. 7.41 (0.6)
MIL	Military status coded 1 if a veteran, 0 otherwise Mean .41 std. dev. N.S. (8.1)
MAR 1	Marital status coded 1 if married, 0 otherwise Mean .415 std. dev. N.A. (1.2)

[1] Glen G. Cain and Robinson G. Hollister, "The Methodology of Evaluating Social Action Programs", in Public-Private Manpower Policies, Industrial Relations Research Association, 1969, p. 23

MAR 2	Marital status coded 1 if separated, divorced or widowed, 0 otherwise Mean .181 std. dev. N.A. (1.2)
HEAD	Head of household coded 1 if trainee is head of household, 0 otherwise Mean .746 std. dev. N.A. (2.3)
DEPS	Number of dependents (including self as a dependent) Mean 2.65 std. dev. 2.22 (3.5)
WELF	Welfare status coded 1 if trainee was on welfare at time of Plan entry, 0 otherwise Mean .291 std. dev. N.A. (0.6)
GRADE	Highest school grade completed (GED coded as 12) Mean 11.59 std. dev. 1.56 (1.7)
KNOW	Knowledge of construction prior to Plan entry coded as follows: 1 if "none", 2 if "very little", 3 if "some", 4 if "very much" Mean 2.60 std. dev. N.A. (1.2)
VOCTRG	Vocational training prior to Plan entry coded 1 if had vocational training, 0 otherwise Mean .471 std. dev. .501 (1.7)
FEDTRG	Participation in other Federal manpower programs Coded 1 if had participated, 0 otherwise Mean .268 std. dev. N.A. (2.9)
FRIEND	Friends/relatives employed in building trades, construction prior to Plan entry coded 1 if yes, 0 otherwise Mean .497 std. dev. N.A. (2.3)
NOFULLJ	Full-time jobs held since leaving school coded as follows: 0 if no jobs, 1 if 1-3 jobs, 2 if 4-6 jobs, 3 if 7-10 jobs, 4 if more than 10 jobs Mean 1.65 std. dev. N.A. (3.5)
NOPARTJ	Part-time jobs held since leaving school coded same as NOFULLJ Mean .634 std. dev. N.A. (5.2)
GRINC	Total income in the year before Plan entry coded as follows: 1 if under $1000, 2 if $1-2,000, 3 if $2100-3000, 4 if $3100-4000, 5 if $4100-5000, 6 if $5100-6000, 7 if $6100-8000, 8 if $8100-10,000, 9 if $10,000-12,000, 10 if over $12,000 Mean 4.78 std. dev. 2.55 (9.8)
NOJBPL	Number of jobs held in year before Plan entry coded 1 if no job, 2 if 1 job, 3 if 2-3 jobs, 4 if 4-6 jobs, 5 if more than 6 jobs Mean 2.15 std. dev. .916 (6.4)

EMPL	Employment at Plan entry coded 1 if employed, 0 otherwise Mean .351 std. dev. N.A. (2.9)
TYPE	Union training program type coded 0 if apprentice, 1 if OJT Mean .52 std. dev. N.A. (0.0)
RTE	Route to placement coded 0 if pre-apprentice, 1 if direct Mean .624 std. dev. N.A. (0.0)
PWAG	Primary wage earner coded 1 if trainee is primary wage earner, 0 otherwise. Mean . 749 std. dev. N.A. (3.5)
LGPRTJB	Longest time on one part-time job. Coded 1 if less than one month, 2 if 1-5 months, 3 if 6-11 months, 4 if 1-2 years. 5 if 2-2 1/2 yrs., 6 if more than 5 yrs. Mean 1.31 std. dev. 1.62 (6.4)
UNEMPYR	Months unemployed in year prior to Plan entry coded 0 if zero months, 1 if less than 1 month, 2 if 1-3 months, 3 if 4-6 months, 4 if 7-9 months, 5 if 10-12 months. Mean 1.70 std. dev. 1.82 (8.7)
PARAS	Any pay raises in union job coded 1 if received any raises, 0 otherwise mean .724 std. dev. N.A. (9.8)
MOSWRK	Month per year work-union construction only Mean 8.10 std. dev. 3.88 (27.7)

CROSSTABULATIONS FOR VARIABLES IN PLACEMENTS-DESCRIPTION

UNEMPYR months unemployed in year prior to Pittsburgh Plan entry

	Terminated		Onboard	
	mean	median	mean	median
PAP	2.11	1.93	2.29	2.31
DIRECT	1.92	0.00	1.31	0.00

NOFULLJ number of full-time jobs since school

	Terminated		Onboard	
	mean	median	mean	median
PAP	1.72	1.62	1.09	1.03
DIRECT	2.37	2.25	1.75	1.49

NOPARTJ number of part-time jobs since school

	Terminated		Onboard	
	mean	median	mean	median
PAP	.778	.900	.488	0.00
DIRECT	.875	0.00	.632	0.00

LGPRTJB longest time on one part-time job

	Terminated		Onboard	
	mean	median	mean	median
PAP	1.72	1.75	1.33	0.00
DIRECT	1.27	0.00	1.23	0.00

GRADE highest school grade completed

	Terminated		Onboard	
	mean	median	mean	median
PAP	12.06		12.06	12.23
DIRECT	10.81	11.62	11.39	11.80

PWAG primary wage earner

	Terminated		Onboard	
	mean	median	mean	median
PAP	.556		.778	
DIRECT	.600		.798	

PARAS any pay raises on union job

	Terminated		Onboard	
	mean	median	mean	median
PAP	16.7	.533	.848	
DIRECT	12.5	.500	.728	

MOSWRK months per year work (union construction only)

	Terminated		Onboard	
	mean	median	mean	median
PAP	3.20	2.50	8.97	10.00
DIRECT	5.21	5.50	8.98	9.72

MIL military status

	Terminated		Onboard	
	mean	median	mean	median
PAP	.412		.386	
DIRECT	.688		.366	

FEDTRG other Federal manpower programs

	Terminated		Onboard	
	mean	median	mean	median
PAP	.278		.244	
DIRECT	.313		.270	

MAR1 married

	Terminated		Onboard	
	mean	median	mean	median
PAP	.333		.3617	
DIRECT	.250		.4888	

MAR2 divorced, separated or widowed

	Terminated		Onboard	
	mean	median	mean	median
PAP	.0000		.1702	
DIRECT	.375		.189	

HEAD head of household

	Terminated		Onboard	
	mean	median	mean	median
PAP	.556		.674	
DIRECT	.750		.820	

WELF on welfare prior to Pittsburgh Plan entry

	Terminated		Onboard	
	mean	median	mean	median
PAP	.389		.348	
DIRECT	.375		.228	

KNOW knowledge of construction (prior to Plan)

	Terminated		Onboard	
	mean	median	mean	median
PAP	2.39	2.61	2.36	2.61
DIRECT	2.25	2.25	2.82	3.04

FRIEND friends or relatives in construction (prior to Plan)

	Terminated		Onboard	
	mean	median	mean	median
PAP	.333		.422	
DIRECT	.400		.582	

VOCTRG vocational training (prior to Plan)

	Terminated		Onboard	
	mean	median	mean	median
PAP	.667		.370	
DIRECT	.313		.511	

APPENDIX C

CONDITIONAL LOGIT ESTIMATION OF THE PROBABILITY OF A BINARY EVENT

THE PROBLEM

Estimating the probability of an event as a function of several screening variables (i.e., indepent variables) which may be either categorical or continuous.

THE GENERAL MODEL

Let y_i be the observed dependent variable such that it takes on a value of 1 if the event occurred and 0 otherwise. Let $\underset{\sim}{X}_i$ be a p-vector of explanatory variables.

$$y_i = \begin{cases} 1 \text{ event ocurred} \\ 0 \text{ otherwise} \end{cases}$$

$$\underset{\sim}{x}_i = (1, x_{i1}, x_{i2}, \ldots X_p)$$

$$i = 1 \ldots N$$

Let X be the observed matrix of dimension N x P with $\underset{\sim}{x}_i$ as its rows. In the usual manner we associate a random disturbance ϵ_i with each observation and the general model is:

$$y_i = f(\underset{\sim}{x}_i, \underset{\sim}{\theta}) + \epsilon_i$$

where $\underset{\sim}{\theta}$ is the vector or parameters of interest. The usual Gauss-Markov assumptions are:

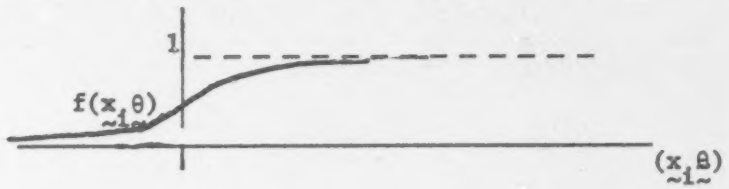
$$E(\epsilon_i | \underset{\sim}{x}_i) = 0 \quad \text{Var}(\epsilon_i | \underset{\sim}{x}_i) = \sigma^2$$

or in probability terms we have:

$$P_i(y_i = 1 | \underset{\sim}{x}_i) = E(y_i | \underset{\sim}{x}_i) = f(\underset{\sim}{x}_i \underset{\sim}{\theta})$$

i.e., the conditional distribution of has mean f(.) and variance σ^2 as the first two moments.

In many applications (e.g., bio-assay, bi-modal choice in transportation etc.) it is reasonable to assume that the P_i will be near 0 over a certain part of the domain of f(.) and montonically increase from 0 to near 1 over an intermediate range of $(\underset{\sim i\sim}{x}\theta)$. It is therefore reasonable to assume that the cdf of the P_i follows a general sigmoid or S-shaped function [See Nerlove-Press (1973); Duncan-Walker (1967)]. Graphically we have



Fitting an approximation to binary observations generated from a non-linear probability distribution is to say the least, difficult. One might try several approaches.

THE LINEAR MODEL

Since ordinary least squares is extremely easy to do one might postulate:

$$f\ (\underset{\sim i\sim}{x}\theta) = \underset{\sim i\sim}{x}'\theta$$

There are, however, several problems associated with this. First, it can be shown that the Bernoulli character of the y_i induces observation dependent variances of the i.e.,

$$V\ (y_i|\underset{\sim i}{x}) = V\ (\epsilon_i|\underset{\sim i}{x}) = \underset{\sim i\sim}{x}'\theta\ (1 - \underset{\sim i\sim}{x}'\theta) = P_i\ (1 - P_i)$$

and thus destroys the homoscedastic assumption of OLS. Second, there is the problem that $x_i\theta$ can lie anywhere on the real line, while P_i must lie between 0 and 1. To correct for heteroscedasticity, one might use Aitken's generalized least squares (GLS) using Goldberger's (1964) two-stage procedure where $y_i.(1 - y_i)$is used as an estimate of the true σ_i^2 using $\hat{y}_i$ estimated from the first stage OLS estimates. But because $\hat{y}_i$ can be greater than 1, the GLS procedure can be invalid as we could get negative variances.

To avoid this we might constrain the y_i to lie in the unit range but this results in a quadratic programming problem, which when corrected for heteroscedasticity, results in a very complex computational problem. In any event, these procedures continued to ignore the binary character of the disturbance term [Nerlove-Press (1973)].

To avoid the restricted range of [i.e., $E(y_i | \underset{\sim}{x}_i)$] one can apply a monotonic transformation to the conditional probabilities such that the resulting variable has range $(-\infty, \infty)$ corresponding to the (0, 1) range of P_i. The two standard transformations are the logit and probit using the logistic and the normal functions respectively. The two are similar conceptually, but the logit transformation is more tractable and will be discussed further. Herein, we use the logistic function to estimate P_i using grouped data (as in a controlled experiment with multiple trials per experiment).

Say we have: $$y_{ij} = \begin{cases} 1 \text{ if event occurs in group } j \text{ on trial } i \\ 0 \text{ otherwise} \end{cases}$$

We assume that the P_j have the form:

$$P_j = [1 + \text{EXP}(- \underset{\sim}{x}_j' \underset{\sim}{\theta})]^{-1} \qquad (2)$$

We transform the P_j using the log-odds i.e., $P_j\ (1 - P_j)$ which can range over the entire real line. Using the transformation and solving for $(\underset{\sim}{x}_j' \underset{\sim}{\theta})$ we get:

$$\ln [P_j | (1 - P_j)] = (\underset{\sim}{x}_j' \underset{\sim}{\theta})$$

Berkson (1944) termed this log-linear model the logit i.e.,

$$\text{Logit } (P_j) = \ln [P_j | (1 - P_j)]$$

where P_j is the MLE of P_j and is defined by

$$P_j = \frac{1}{n_j} \sum_{i=1}^{n_j} y_{ij} \quad \text{where } n_{ij} = \text{number of trials in expt. } j$$

However, the use of logits demands grouped data while it is assumed here that every cell has either 1 or no observations (i.e., some of the variables are continuous and are not under control as in bio-assay or other pure experimental situations.) We could proceed by categorizing the continuous variables but much valuable information would be lost by that procedure. We are thus forced to discard the logit formulation.

VARIANCE STABILIZING TRANSFORMATIONS:[1]

With this technique there is the same fundamental problem as with Berkson's logit transformation, i.e., the lack of grouped data in our problem.

MLE OF THE LOGISTIC FUNCTION PARAMETERS

Estimation of the model specified by Equation 2 is fairly standard procedure [Berkson, (1955 and Cox (1970)][2]. We can thus work directly with the logistic function without the logit transformation and thus without the need for grouped data. The likelihood function for Equation 2 is

$$L\ (y_1, y_2, \ldots y_N | x_1, x_2, x_3 \ldots . x_N) = \prod_{i=1}^{N} P_i^{y_i}\ (1 - P_i)^{(1 - y_i)}$$

and the $\ln(L)$ is:

$$\sum_{=1}^{N} y_i \ln(P_i) + (1 - y_i) \ln(1 - P_i)$$

The first order conditions for the maximization of $\ln(1)$ are:

$$\frac{\partial \ln(L)}{\partial \underset{\sim}{\theta}} = \sum_{i=1}^{N} y_i \underset{\sim}{x}_i - \sum_{i=1}^{N} \underset{\sim}{x}_i P_i = 0 \qquad (3)$$

since $\dfrac{\partial \ln(P_i)}{\partial \underset{\sim}{\theta}} = \underset{\sim}{x}_i' Q_i$ and $\dfrac{\partial \ln(Q_i)}{\partial \theta} = \underset{\sim}{x}_i P_i$ where $Q_i = 1 - P_i$.

Since $\ln(L)$ is globally concave, Equation 3 yields an absolute maximum. Thus the MLE of satisfies the vectorial equation below:

$$\sum_{i=1}^{N} [1 - EXP\ (- \underset{\sim}{x}_i' \underset{\sim}{\theta})]^{-1} \underset{\sim}{x}_i = \sum_{i=1}^{N} \underset{\sim}{x}_i y_i$$

and the probability of the event given an observed vector is estimated by:

$$P_i = [1 + EXP(- \underset{\sim}{x}_i' \underset{\sim}{\theta})]^{-1};\ x_i = \sum_{i=1}^{N} \underset{\sim}{x}_i\ y_i \qquad (4)$$

NON-LINEAR WEIGHTED LEAST SQUARES

The usual technique for solving Equation 4 is the Newton-Raphson method. The major problem with this numerical technique is that it appears to be

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[1] See Rao, Chapter Linear Statistical References and It's Applications 2nd ed., Wiley, New York (1965) pp. 426-428.

highly sensitive to the starting values. One method that has been suggested to circumvent this problem is called non-linear weighted least squares [See Duncan-Walker (1967) and Perry (1975)]. The primary advantage of this technique is that one can use Kalman's (1960) work in linear dynamic filtering and prediction in control systems to derive a recursive estimation procedure.

Recalling Equation 2 we have:

$$P_i = [1 + EXP\ (\ -\underset{\sim}{x}_i'\underset{\sim}{\theta})]^{-1}$$

Expanding $f\ (\underset{\sim}{x}_i\underset{\sim}{\theta})$ about some initial estimate $\underset{\sim}{\bar{\theta}}_i$ using a Taylor's series and ignoring higher terms we have

$$y_i \approx f(\underset{\sim}{x}_i'\underset{\sim}{\theta}) + f'(\underset{\sim}{x}_i'\underset{\sim}{\theta})\Big|_{\underset{\sim}{\theta} = \underset{\sim}{\bar{\theta}}} (\underset{\sim}{\theta} - \underset{\sim}{\bar{\theta}}) + \epsilon_i$$

Rearranging and letting

$$y_i^* = y_i + f'(\underset{\sim}{x}_i\underset{\sim}{\theta}) - f(\underset{\sim}{x}_i\underset{\sim}{\theta})$$

we get

$$y_i^* \approx f'(\underset{\sim}{x}_i\underset{\sim}{\theta}) + \epsilon_i\ .$$

Define $\underset{\sim}{x}_i^* = \bar{P}_i\bar{Q}_i\underset{\sim}{x}_i$; then $y_i^* = \underset{\sim}{x}_i'\underset{\sim}{\theta} + \epsilon_i$ or in matrix notation $\underset{\sim}{y}^* = X^*\underset{\sim}{\theta} + \underset{\sim}{\epsilon}$

This is now in the usual linear form. The diagonal weight matrix is merely the inverse of each element of the diagonal matrix $E(\epsilon_i\epsilon_i') = [P_iQ_i]$.

These weights must also be estimated from the data. The normal equations in this case are:

$$(X^{*\prime}W\,X^*)\ \ \underset{\sim}{\theta} = X^{*\prime}\ W\ y^*$$

But

$$\underset{\sim}{x}_i^* = \bar{P}_i\bar{Q}_i\ \underset{\sim}{x}_i \quad \text{or} \quad X^* = W^{-1}X$$

Thus,

$$\underset{\sim}{\hat{\theta}} = (X'W^{-1}X)^{-1}\ X'W^{-1}\underset{\sim}{y}$$

The above is thus a special case of Aitken's generalized least squares estimator.

HYPOTHESES

The two general kinds of hypotheses tested are for the overall significance of the model and the significance for an individual parameter. Specifically, the hypothesis for the model was:

$$H0: \quad E(y_i = 1 \mid x_1) = \bar{y} \text{ against}$$

$$H1: \quad E(y_i = 1 \mid x_i) = P_i$$

i.e., the null hypothesis was that the probability of success given x_i, the characteristics vector, was equal to the mean probability of success of the population against the alternative hypothesis that it was equal to P_i which in turn was equal to $[1 + EXP(-\underset{\sim}{x}_i \underset{\sim}{\theta})]^{-1}$. The log likelihood ratio for these two hypothesis is:

$$\lambda = \frac{\prod_{i=1}^{N} \bar{y}^{y_i} (-\bar{y})^{(1 - y_i)}}{\prod_{i=1}^{N} P_i^{y_i} (1 - P_i)^{(1 - y_i)}}$$

and as shown by Wilks (1938), twice the log likelihood ratio is χ^2 distributed with $(p - 1)$ degress of freedom.

Tests for individual parameters were performed assuming that the erros were distributed asymptotic normal. This allows us to compute the t-statistics for the hypothesis under test. All tests performed were one-tailed tests since it was the direction of the influence of a parameter that was of prime interest rather than its specific value. The null hypothesis was $\underset{\sim}{\theta} = 0$ against the hypothesis $\underset{\sim}{\theta} \neq 0$. The lowest level of significance deemed acceptable was set at 90%.

ANALYSIS OF COVARIANCE

The log-likelihood equivalent of the Chow test for equality of regressions is given by[1]:

$$\frac{\sum_{i=1}^{M} \ln \lambda_i}{\sum_{i=1}^{M} P_i} \Big/ \frac{\ln \bar{\lambda}}{\bar{P}} \sim F(\sum_i P_i, P)$$

where: $\ln \lambda_i$ is the log likelihood of the ith unrestricted equation

P_i is degrees of freedom of the ith unrestricted equation

$\ln \bar{\lambda}$ is the log likelihood of the restricted equation

$\bar{P}$ is the number of degrees of freedom of the unrestricted equation.

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[1] See Frederking, Margaret A. "The FCC and Comparative Broadcast Licensing: Policy Implications of Decision Making Models", Unpublished Ph.D. dissertation (1976) Carnegie-Mellon University.

Twice the log-likelihood ratios follow a χ^2 distribution and the ratio of two χ^2 divided by their respective degrees of freedom follows an F distribution. In general two types of hypotheses were tested. In the first all parameters of the unrestricted models were allowed to vary. In the second only the intercept term was allowed to vary. The analysis of covariance as formulated can test for the difference between two or more sets of coefficients. For further details on this type of analysis see Johnston (1972).

APPENDIX D

METHODOLOGY OF COST ANALYSIS

Functional Cost Breakdown

The cost analysis attempts to attach costs to program functions such as recruiting, teaching, etc. It was found that Plan staff performed multiple roles in the everyday functioning of the Plan.

The matrix below was used as a questionnaire by members of the Research Team who conducted personal interviews at all three training organizations. An interactive process (similar to a Delphi process) was used in which interviewers were asked to break down the tasks of each member of the staff at each of the three training organizations according to the functional role (recruiting, teaching, etc.) that they perform and to assign percentage of effort to each of these functions. This interactive group process was used in order to avoid personal bias in estimating task assignments.

The basic assumption used in applying these functional assignments in performing the cost analysis is that persons who had previously held the same staff slot at the same training organization performed these functions in the same proportions as do their present counterparts. This does not seem unreasonable to the Research Team since wholesale changes in staff and program functions have not occurred.

Functional Role

Job Title	Recruit	Select for PAP	Counsel	Train	Select/ Place	Follow-up	Other
Coordinator							
Teacher							
Counselor(In-House)							
Recruiter/Follow-up							
Secretary							
Custodian							
Accountant							
Fiscal Director							
Executive Director							

After developing our own estimates of the functional effort breakdowns, we went to the organizations for verification. The corrected estimates as provided by the organizations' staffs are used as the final estimates for the functional cost breakdowns. The matrix above is then complete for each of the three training organizations. To convert percentage of effort to cost the total assignment of budget funds to each job title at each organization for 1971-75 was obtained from Plan budgets. These budget commitments were then distributed across functions in accordance with the job title-functional role matrix.

Cost Development for the Transportation Model

The Transportation Model requires as inputs the vector of cost C_{ij} representing the total cost of processing an individual from input state i to output state j. These costs have come primarily from the breakdown of cost by function (also discussed in this Appendix). This historical breakdown is modified slightly to accomodate the various scenarios of program operation which were modeled.

Four Output Scenario - PAP

In Table 1 costs are categorized as follows:

C1 Cost applying exclusively to PAP trainees
C2 Cost applying to all persons served by the Plan
C3 Cost applying exclusively union placements
C4 Cost applying to all persons served by the Plan except those entering jobs other than the trade unions.

Costs are incurred as in the matrix below:

	C1	C2	C3	C4
Direct Placements (N=556)		X	X	X
PAP Placements (N-252)	X	X	X	X
PAP employed other (N=266) jobs	X	X		
PAP not placed (N=911)	X	X		X

N is number of persons.

Table 1

Cost Assignments for Transportation Model - Four Output Scenario (Dollars)

Function	Number of Persons Served	Cost Category	Assignments per Person Served	Total Budget For Function*
Recruiting	1983	C2	45.39	90,016
Selection for PAP	1427	C1	59.52	85,052
Counseling(In-House)	1427	C1	206.42	294,969
Training	1427	C1	456.26	651,992
Selection/Placement	1717	C4	95.38	163,768
Follow-up	808	C3	497.96	402,348
Other Training Organization Costs	1983	C2	579.00	1,148,154
Administrative Comm.	808	C3	129.81	104,886
Coordinating Comm.	808	C3	437.12	353,194

*Taken directly from functional cost breakdown of Cost Analysis.

The cost per participant for the four output scenario is then:

direct placement (union)	$1,785
PAP placement (union)	2,507
PAP employed elsewhere	1,347
PAP not placed	1,442

Three Output Scenario - PAP

The categories of costs, C1 to C4 are defined to be the same as for the four output scenario. (See Table 1)

Costs are incurred as shown in the matrix below:

	C1	C2	C3
direct placements (union) (n=556)	X	X	
PAP placements (union) (N=252)	X	X	X
PAP not placed (N=1,175)	X	X	

The cost per participant for the three output scenario is then:

direct placement (union)	$1,772
PAP placement (union)	$2,494
PAP not placed	$1,429

The cost breakdown for this scenario is identical to that in Table 1 except that "selection/placement" becomes a category C2 cost serving 1,983 persons for a cost of $82.59 per trainee.

Trainee Opportunity Costs for Benefit-Cost Calculations

Participant Category	Mean Number of Days Attended PAP Training*	Number of Trainees**
Placed in unions	94.9	252
Employed in other jobs	72.7	266
Not Placed	72.6	911

*From DOL MA-102 forms

**From records of Coordinator's Office, Pittsburgh Plan

Multiplying number of days attended by number of trainees for each category and summing yields approximately 109,000 trainee days attended. This corresponds to approximately $454,000 in opportunity cost (with prior annual income of trainees estimated to be $1,078 from MA-101 data).

APPENDIX F

METHODOLOGY OF BENEFITS ANALYSIS

BENEFIT-COST ANALYSIS OF PITTSBURGH PLAN OPERATION - 1971-1975 - ESTIMATES OF PARAMETERS

Estimate for Probability of Reaching Journeyman

In order to calculate the benefits of increased earnings for those trainees placed in union training it is necessary to predict the number of these trainees who will eventually become journeymen, receiving their union "book". The benefits calculations regard the attainment of journeyman status as an event which produces a relatively permanent increase in earnings; it is assumed that all who reach journeyman will remain at this income level for the remainder of their working life. The estimate of the actual number of individuals who will so benefit from union placement is therefore critical. Because of this fact the topic of failure (the inverse of staying on to become a journeyman) has received much attention. (See Chapter 5 for a full discussion of the actual estimating methodology).

There are several dimensions along which the trainee population may be divided allowing empirically based estimates of termination probability to be formed. It was decided to use the distinction of route to placement (PAP or direct) for the benefit-cost analysis estimates both because this dichotomy provided significantly different probabilities and because this represents a controllable variable for program managers - the type of program that they choose to operate.

The four probability estimates used in the benefits calculations for the historical benefit-cost analysis (and applied to the corresponding trainees) are the following:

	Probability of Remaining in Union*
PAP placements prior to 1973	.461
PAP placements 1973 to 1975	.587
direct placements prior to 1973	.707
direct placements 1973-1975	.795

*For five years of training or more.

Estimate of Journeyman Earnings

The estimate of journeyman earnings is a "full-employment" estimate depending only on the estimated hours per year worked (wage is fixed). This estimate represents the upper bound to the possible non-overtime hours which each trade would on the average be allowed by weather restrictions to function over the year in Western Pennsylvania. The estimates are based on a consensus reached between the responses of trainees to the field survey and the expert estimates of Plan staff.

These upper bound estimates are superior to the responses obtained from the field survey because the trainee responses are confounded by seasonal work limitations relevant to each specific union and by the extreme slowdown in the construction industry in Western Pennsylvania at the time the survey was administered. (See the "Unemployment Fact Sheet", Bureau of Employment Security, Commonwealth of Pennsylvania, 1960-1976 for detailed statistics.

Using these estimates the average journeyman earnings per year and average earnings for a 17 months stay (average stay in training for those who eventually terminate) are estimated using the data in Table 1.

Finally, these estimates of earnings to journeymen and to those who terminate were used to derive an average yearly earnings estimate weighted by the number of placements made by the Pittsburgh Plan in each union for the period 1971-1975. It is these weighted average earnings estimates which are actually used in the benefits calculations of all analyses.

Estimate of Percentage of Time Worked

This estimate is a factor entered in the benefits calculation model to adjust the "full-employment" earnings to account for the fact that most union members do not work 40 hours per week, 52 weeks per year (which was the base used in calculating annual journeyman's earnings). This parameter is varied in the sensitivity analysis and the benefits are shown to be highly sensitive to its value (assumed journeymen have no other income when not on the union job). Estimates of experts in the Plan management are that 80% time worked. out of all possible hours of work, is a reasonable estimate. This estimate is used in the benefits calculations throughout the analyses. The time assumed not worked should account for vacation and time lost in switching between construction job sites.

TABLE 1

UNION EARNINGS FORMULATION

	Union	Maximum Possible Hours/Year	Journeyman Annual Earnings ($ Thousand)	Negotiated Wage** (Most Recent)	Average % Journeyman wage for stay of 17 months in Union Training**
1.	Asbestos	2.080	21.570	10.37	71.7
2.	Boilermaker	2.080	20.426	9.82	72.5
3.	Bricklayer	1.503	15.346	10.21	50
4.	Carpenter	1.733	15.996	9.23	60
5.	Cement Mason	1.560	14.586	9.35	65
6.	Electrician	2.080	21.008	10.10	50
7.	Elevator Const.	2.080	20.363	9.79	72.7
8.	Glazier	1.820	17.090	9.39	50*
9.	Ironworker	1.635	15.827	9.68	70
10.	Lather	2.080	18.678	8.98	58.3
11.	Operating Engr.	1.543	14.442	9.36	83.9
12.	Painter	1.733	16.481	9.51	50
13.	Plasterer	2.080	19.531	9.39	55
14.	Plumber	1.803	18.048	10.01	45
15.	Roofer	1.357	13.719	10.11	75
16.	Sheetmetal	2.080	19.926	9.58	55
17.	Sprinkler	2.080	21.736	10.45	50*
18.	Steamfitter	2.080	20.155	9.69	45
19.	Stone Mason	1.820	17.654	9.70	50
20.	Tile Setter	1.820	18.291	10.05	50*
21.	Tile Helper	1.820	14.724	8.09	50*

* Assumption - no information available.

** From "Wage Rates and Information, Western Pennsylvania Building Construction Industry" published by the Construction Advancement Program of Western Pennsylvania.

Estimate of Probability of Getting Another Job for those Who Terminate From Union Training

A set of questions in the field survey were designed to determine what happens to people after they terminate from union training. Because the responses to these questions were few. the reliability of the estimate used in the benefits calculations cannot be verified. The actual estimate used, based on survey response, is that 40% of those terminating from union training are able to find employment in jobs with significantly higher earnings than those held prior to Plan entry. Fortunately, the sensitivity of the benefits calculations to this estimate was found to be minimal.

Estimate of Earnings in Other Jobs Obtained by Those Who Leave Union Training

There is a lack of data concerning the type of jobs entered and the earnings in those jobs for all placements other than the building trades. The strategy in developing an estimate in the absence of a significant sample of empirically observed earnings is to draw on a number of sources and use an average of the various estimates so obtained. The results are below:

Source	Estimate of Median Annual Earnings
Field Survey (N=10)	$6,916
Records of placement unit of OIC which pursues "other jobs" on a full-time basis	$4,800 - $10,400
1970 Census; all Black males in Pittsburgh residing in "low-income" areas	$6,680

The final estimate used in all benefits calculations is $7,000. The calculations were found to be relatively insensitive to variation of the "other jobs" earnings estimate.

Estimate of Earnings Prior to Plan Entry

For PAP placements this estimate comes from the DOL MA-101 and MA-102 data (MA-101 form). For direct placements this estimate is derived from the median response to the question in the field survey.

Estimates used are: PAP $1,974
Direct $5,500

Discount Rate Used

All benefits calculations were based on a discount of 10%. Journeymen benefits were based on earnings streams of thirty years.

Calculation of Union Earnings Benefits

These benefits were calculated using the model on the following pages (which was included in Benefit-Cost Analysis for clarity).

Benefits = expected union earning + expected in other jobs
- non-participants earnings

Union earnings = journeymen earnings + earnings for those who terminate

Earnings for those terminating = earnings while in union training
+ earnings from other jobs.

Journeyman earnings = PROB times EARN times WORK times DISCOUNT

where:

PROB is (1-probability of terminating from union training during the first five years after placement)[1]

EARN is an estimate of the average yearly earnings of journeymen for "full employment" weighted by number placed in each union

WORK is an estimate of the proportion of "full employment" time per year that those in the crafts will work over the projected working lifetime of thirty years[2]

[1]See Analysis of Failure for a thorough discussion of this concept and the derivation of estimates used.

[2]"Full employment" accounts for the seasonality of work in specific trades in the Pittsburgh area.

DISCOUNT is a factor which converts the stream of earnings to a present value estimate

Earnings for those terminating = [(1 - PROB) X TERMEARN X WORK X DISCOUNT] + [(1 - PROB) X PROB2 X EARN2 X DISCOUNT] + [(1 - PROB) X (1 - PROB2) X PRIOR X DISCOUNT)]

where:

TERMEARN is an estimate of the average earnings for the first 17 months stay in the union training programs weighted by the number placed in each union.[1]

EARN2 is the average yearly earnings in other jobs obtained following from union training (if greater than prior earnings)

PROB2 is an estimate of the proportion of persons who, after terminating from union training, obtain other employment due to participation in the Pittsburgh Plan

PRIOR is the median annual earnings of successfully place participants in the year prior to their entry into the Pittsburgh Plan process

Non-participant earnings = PRIOR X DISCOUNT

Benefits Calculations for the Transportation Model

Benefits are derived for the Transportation Model in exactly the same fashion as for the historical benefit-cost analysis. Probabilities of termination from union training used are the five-year estimates based on the 1973-1975 group.

ASSUMPTIONS EMPLOYED IN BENEFITS CALCULATIONS

Time Span of the Evaluation and Associated Assumptions

In evaluating an ongoing program such as the Pittsburgh Plan, problems arise when attempting to link program effects to program expenditures over time. This is especially true when the program effects are expected to occur much later than the related expenditures, as is the case in many manpower efforts. Two distinct obstacles to precise evaluation exist; determining

[1]The average length of stay is estimated to be approximately 17 months for those who terminate from union training.

(forecasting) what the expected effects are, and attributing these effects to the correct resource use over time. Forecasting difficulties are countered through the use of appropriate assumptions which are documented in the course of the analysis. Following is a discussion of how accounting for effect of expenditures over time is handled.

If costs are to be related to results (either in terms of persons placed or economic ramifications) then the time periods of resource use and resulting union placements must be made consistent. In this regard, it should be remembered that at least a portion of the 1975 expenditures cannot be expected to have contributed to those placements reported as occuring during 1971-1975. These placements will occur in 1976.

There are three possible strategies to deal with this situation:

(1) shorten the time frame to 1971-1974 and determine those placements in 1975 due to 1974 expenditures

(2) estimate those as yet forthcoming placements due to 1975 expenditues

(3) include only those placements actually made prior to December 31, 1975 as a conservative estimate of program benefits

The third alternative has been chosen.

THe basic assumptions underlying the forecase of labor force experiences of the program participants are as follows: the program will have little effect on the experiences of those who drop out without completing the pre-apprentice program or being placed in a union training program; of those who do achieve journeyman status, a very high percentage will retain this employment status throughout the thirty year forecast period; a much higher level of attrition will occur within the group of trainees who are placed in union training programs but have not yet achieved journeyman status. Any increased employment and wage benefits to this group in alternative employment following termination from union training is noted.

The Use of Control Groups in Evaluating Pittsburgh Plan Results

The theoretical framework of evaluations of manpower programs is statistical, the employment, wage and income experience of targeted individuals is compared with what is believed to be their expected experience had the program in question not been executed. The methodology paralles that of a laboratory

experiment; dependent variables (such as employment, wages, and income) are isolated, independent variables are divided into those controllable by program management (endogenous variables) and those that are non-controllable (exogenous variables), hypotheses are formed that attempt to explain the variation in achievement or "success" found in dependent variable effects, data (appropriate to test the hypotheses) is gathered and analysis of variance is performed to confirm or reject the nypotheses. Thus, the program is perceived to be the "treatment" which may or may not cause differences in the labor force experiences of its participants.

Of course, there are many other factors or "effects" present which may cause variation in labor force experience other than the manpower program itself. In order to isolate the "due treatment" source of variation and provide a fair program evaluation, it is necessary to also study the experience of a control group of individuals who are exposed to the same set of labor force influences as are the program participants except for the program itself.

Unfortunately, this evaluation is not able to compare the observed experiences of program participants, in terms of the dependent variables of employment, income and wages, with an exclusive set of individuals serving as a control group. Instead, this study will use the "before-after" technique of control rather than the "with-without" technique, recognizing that the latter is definitely superior.[1] The labor force experiences of trainees after having been exposed to the program is compared to the experiences of these same individuals prior to program entry, with the major portion of any observed differences in these "before-after" experience being assumed to be "due treatment". This difference merely serves as a proxy for the difference that would be measured by comparing experiences of a homogenous population of individuals exposed to the same labor environment, and divided into control and program participant groups. The difficulties with the "before-after" control technique arise mainly because it is very difficult to determine whether the observed changes in labor force experience with time is due to changes in other variables over time, such as changed labor demand, inflation, and changes in government policy.

[1]Burton A. Weisbrod, "Conceptual Issues in Evaluating Training Programs", in Monthly Labor Review, 89, October 1966.

Assumptions Associated with Use of Increased Earnings as a Measure of Program Benefits

This discussion concerns allocative efficiency alone and whether the use of changes in income due to participation in the Pittsburgh Plan is a valid measure of efficient use of resources. Of course, this rules out consideration of the distributional effects of the program, which are probably the prime motivation for its initiation. It has been argued elsewhere that although a manpower program is not "efficient" in the strict allocative sense that this does not mean that the program is not desirable, "the analyst should not be satisfied with investigation of program efficiency alone...(When programs are explicitly intended to help certain groups of people."[2] Nevertheless, the following ignores distributional effects.

The most fundamental question to be faced is the following: Does the program actually increase national product? For programs such as the Pittsburgh Plan, whose primary goal is to change the status quo employment of a particular group of people, it is questionable whether increased employment of this group actually represents a true increase in national product. If it is believed that income is a reliable proxy for national product, then the question is whether gross national income was increased by the Plan's operation. Or, alternatively, having determined the increase in income for the program participants, what was the change (if any) in income for the other members of the population non-participants? If the trainees simply displaced other workers one-for-one, then national product was not changed. If however, the potentially displaced workers could find alternatively employment at the same earnings level elsewhere, then trainees' changes in earnings is a proper measure of benefits.

Another question related to the use of the "before-after" type of self-control is estimating the treatment is the phenomenon of "self-selection". This occurs when the population which applies for and completing training is a "more ambitious" population than is the total population of potential participants.[3] This leads to the hypothesis that this self-selected population would have, in the absence of the program, had higher earnings and better

[2]Burton A. Weisbrod, "Conceptual Issues in Evaluating Training Programs", in Monthly Labor Review, 89, October, 1966

[3]Ibid

employment histories than would the total population of potential participants. Thus, even with an independent control group, it may be argued that his extra ambition, rather than program "treatment", accounts for part of observed increased earnings.

The program may to some extent be simply choosing those persons who would have had the "motivation" needed to raise their wage and income levels through their own efforts. (Of course, for the specific cases of the building trades unions, institutional barriers to occupational mobility must be overcome. This could not be accomplished without the Plan in many cases).

Another consideration in benefits calculations is that the estimate of lifetime earnings in the absence of the program may be understated if based solely on income in the year prior to program entry. This is expected because persons entering training programs are on the average inherently in a "high unemployment" state relative to that to be experienced over their entire working lifetimes.

A final implicit assumption to be noted is the use of wages in the trade unions as a measure of marginal productivity. The control of the labor supply by the unions tends to keep wages "high" (one of the prime motivations for forming the union) and thus may overstate the true output value of union member work.

APPENDIX F
DETAILS OF FAILURE ANALYIS

The data, generated from records maintained by the Pittsburgh Plan Co-ordinator's Office contained 763 observations on 11 variables. The following list describes them:

MOIN	Month placed
DAYIN	Day placed
YRIN	Year placed
MOOUT	Month of exit from program*
DAYOUT	Day of exit from program*
YROUT	Year of exit from program*
UNION	Union
RTE	Placement route i.e., PAP or direct
TYPE	Type of training program i.e., Apprentice or On-the-Job Training
ORG	Orgnization
STATUS	Current status in union (i.e. as of 12/31/75)**

The 763 observations represent 94% of the entire population. A majority of the 808-763=45 observations not in this dataset were eliminated because either or both dates of placement and exit from program were missing. Also, individuals who left the unions for military service or were terminated due to incarceration or died were eliminated. On the whole, as the following tables show, the data appear to be a very good sample of the population.

TABLE 1

	BIDWELL	DIG	OIC
DATA	181	328	248
REPORTED***	207	342	258

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* If the person was on-board on 12/31/75 the data were coded to this value for the sake of completeness.

** The status of the individual was recorded as it was on 12/31/75. Therefore, individuals terminated or who received their books in 76 were recorded as being on-board.

*** From Monthly Narrative and Statistics Report prepared by the Pittsburgh Plan Co-Ordinator's Office.

TABLE 2

	APPRENTICE	OJT
DATA	334	429
REPORTED*	353	455

TABLE 3

	PAP	DIRECT
DATA	248	515
REPORTED**	254	554

TABLE 4

	1969	1970	1971	1972	1973	1974	1975
DATA	1	9	162	143	140	172	136
REPORTED[a]	-	-	249	171	141	208	264

The following graphs of the number of terminations from union training programs in a quarter vs. the length of service in quarters indicate the very erratic failure pattern exhibited by the Pittsburgh Plan participants.[b] In common parlance, no matter which way one cuts the sample, the similarity of the results is inescapable.

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*From Monthly Narrative and Statistics Report prepared by the Pittsburgh Plan Co-Ordinator's Office

**Computed from data gathered from the Pittsburgh Plan Co-Ordinator's Office

[a] The discrepancy in totals arises because of 1) the reporting convention used by the above office; and 2) these figures include those placed but not validated.

[b] An interval length of one month was tried and found to be too fine a breakdown

Figure 1 - PAP Placements

Figure 2 - Direct Placements

Figure 3 - Apprentices

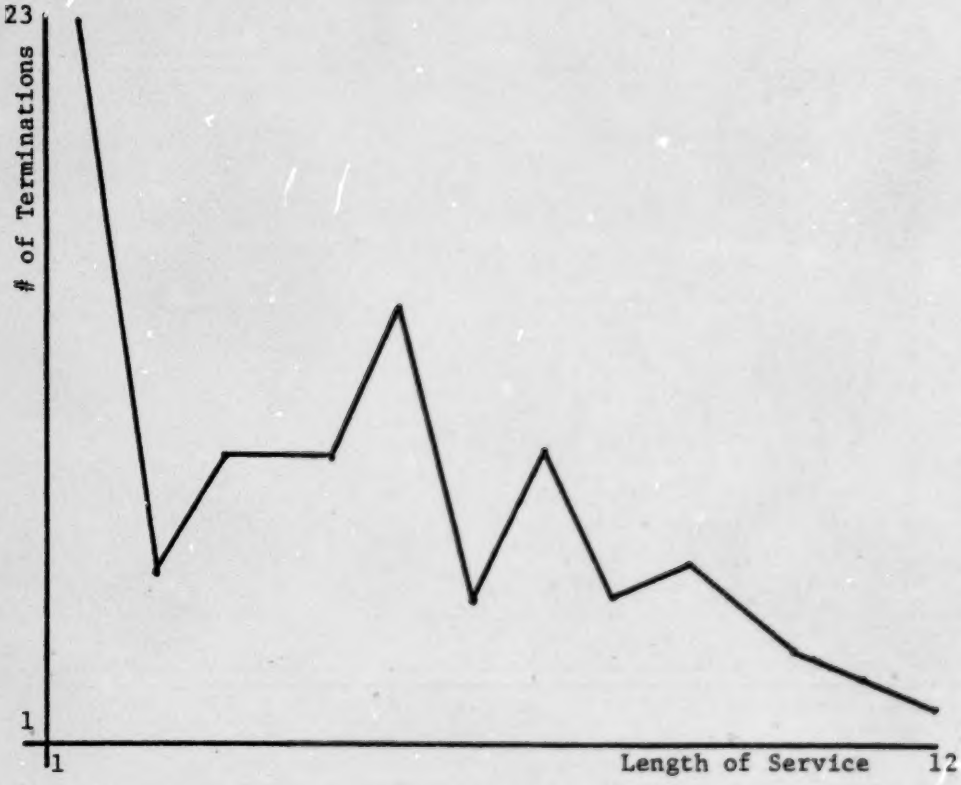

Figure 4 - 1971 Cohort

Figure 5 - On-the-Job Trainees

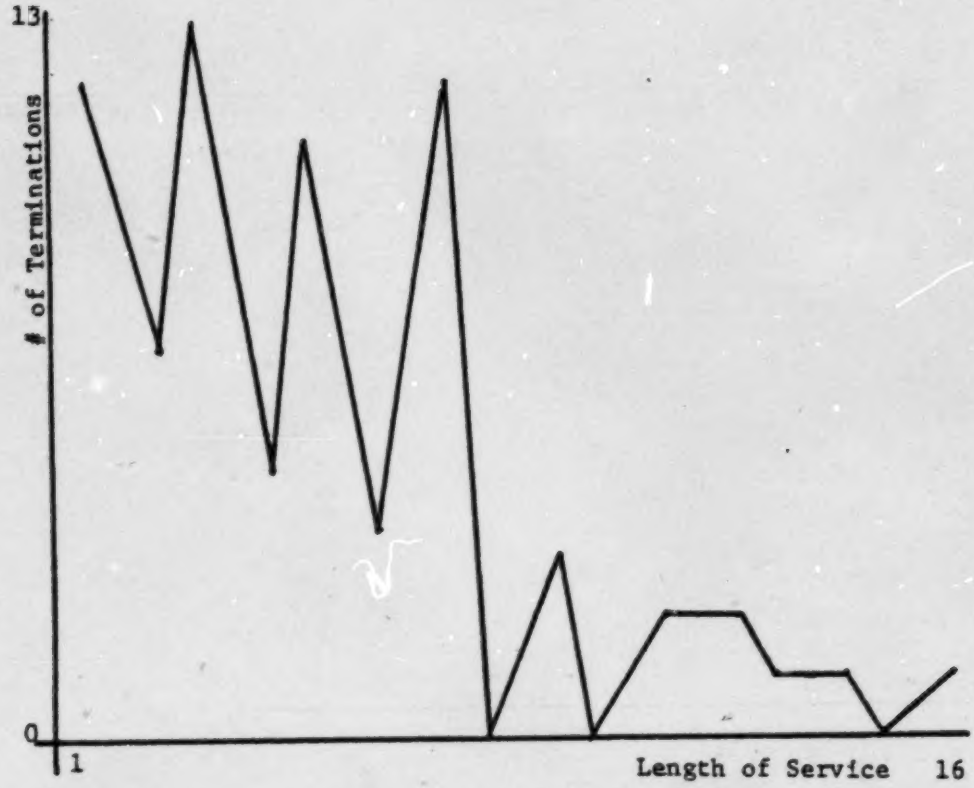

Figure 6 4 Year Unions

The Simple Markov Chain Model[1]

The simple Markov Chain model is defined for seven transition states YR 1, YR 2, YR 3, YR 4, YR 5, J-Man, Terminated. By the very nature of the definition the only possible transitions between these states are given below:

	YR1	YR2	YR3	YR4	YR5	JMAN	TERM
YR 1		X				X	X
YR 2			X			X	X
YR 3				X		X	X
YR 4					X	X	X
YR 5					X	X	X
JMAN						X	
TERM							X

Table 5

Note that the transitions from YR5 are marked such that the person transits either into YR5, to JMAN or TERM. These seemingly erroneous transitions were necessitated by nature of the state definitions aggravated by data limitations. We could have added another state - YR6, but would have run into the same problems while defining transitions from YR6. In any event, since the total period of interest was set at 5 years this artificial solution does not raise any problems.

To calculate the probabilities for various clusterings, the base population figure used was computed by totaling all persons who could have entered the state of interest from which the subset which either already entered JMAN or TERM states was removed. This ensured that the transition probabilities were conditional probabilities.

There were three sets of tests performed to test the stationarity and homogeneity assumptions of the simple Markov Model. The first was a test of time stationarity of these probabilities for the entire population. All tests were simple graphical tests which yield visual confirmation of stationarity.[2]

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[1] For a description of Markov Chain Models and other approaches to manpower systems see Bartholomew, D.J., Stochastic Models for Social Processes (1973) New York J.Wiley

[2] See Forbes, A.F. (1965) for a discussion of the tests used.

The vertical lines in these graphs indicate the probability of transition along with the 'spread' calculated as the computed probability +/- its standard deviation. The horizontal line represents the pooled probability (i.e., calculated by pooling all the cohorts or groups together).[1] The decision rule is simple: if the vertical lines all cross the horizontal line, the transition probabilities for that particular transition are considered to be a stationary. The first test was for stationarity i.e., it was a test to see if the transition probabilities were constant over time. Note that the graphs for transitions beyond the first year contain progressively fewer points. This is because not all cohorts in any sub-group have had the chance to transit out of any particular state after the first. For example, the 1975 cohort had had only one year in which to transit and thus the graphs for the first year transition probabilities contain 5 (or 10 in the pooled case) points and the second year transition probability graphs contain only 4 (or 8) points.

The second test was to determine if the assumption of population homogeneity was valid. The two groups compared were PAP and direct placements. The third test was a test of stationarity of transition probabilities for each of the two sub-groups treated separately. Below are reproduced a few selected graphs, some combining the two tests. This pooling of graphs was done for illustrative purposes only so that one could see the non-homogeneous and the non-stationary properties of both the sub-groups. The vertical lines in these graphs are the same as before and the horizontal line represents the overall probability pooling both the groups and the appropriate cohorts.

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[1] Assuming that they are distributed approximately normally, the true value should lie between the end points 70% of the time. Note that the estimated transition probabilities are marked with a cross (x).

Figure 7 - YR1 to YR2 All Placements

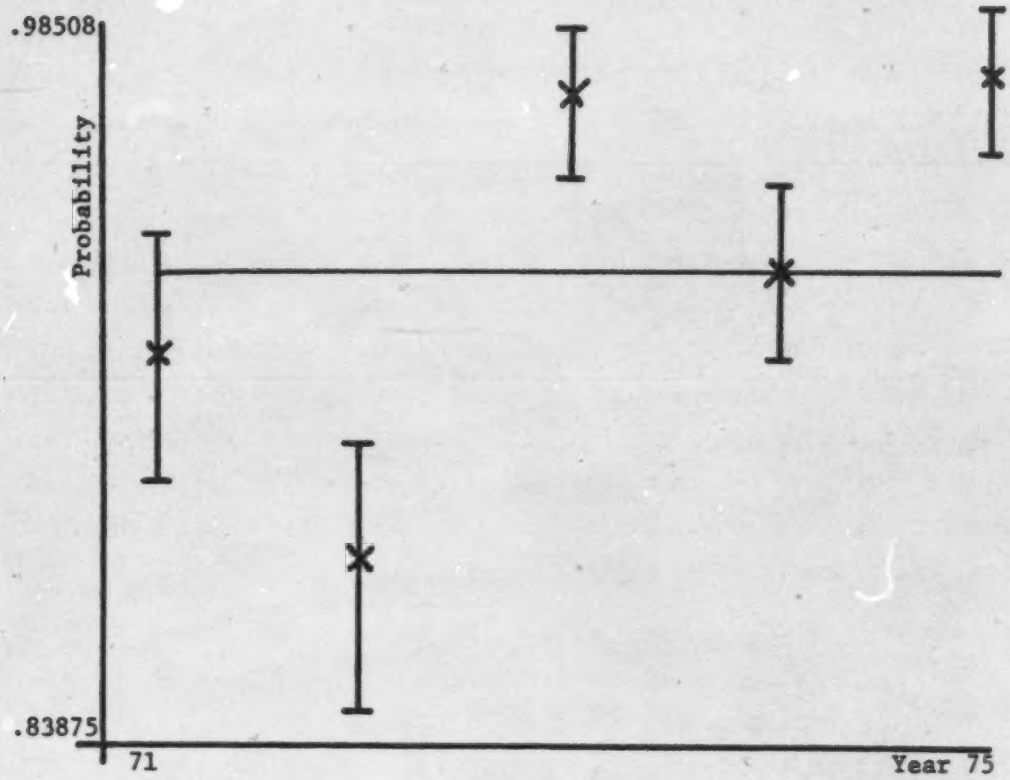


Figure 8 - YR1 to Term All Placements

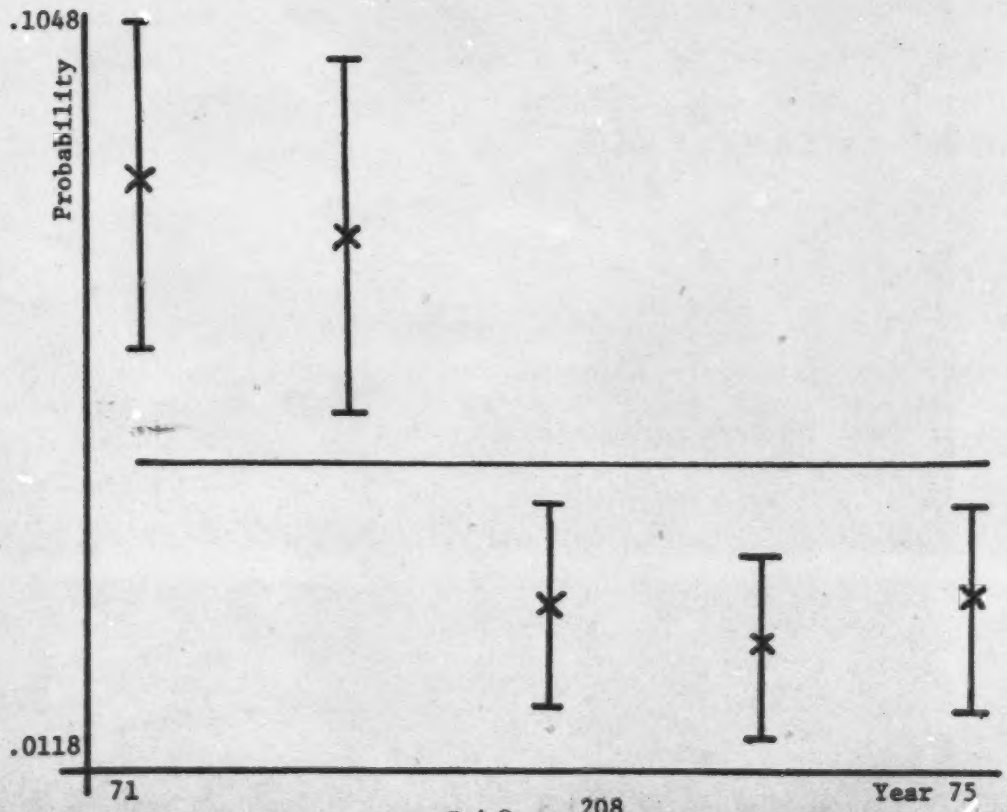


Figure 9 - YR2 to JMAN All Placements

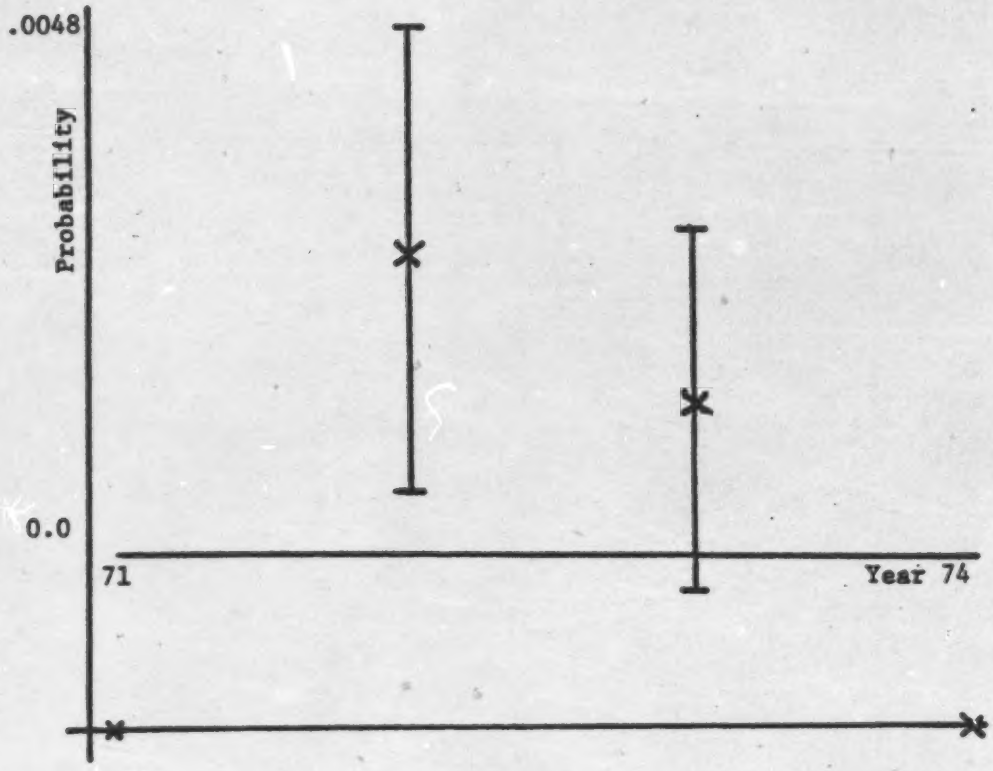


Figure 10 - YR2 to TERM All Placements

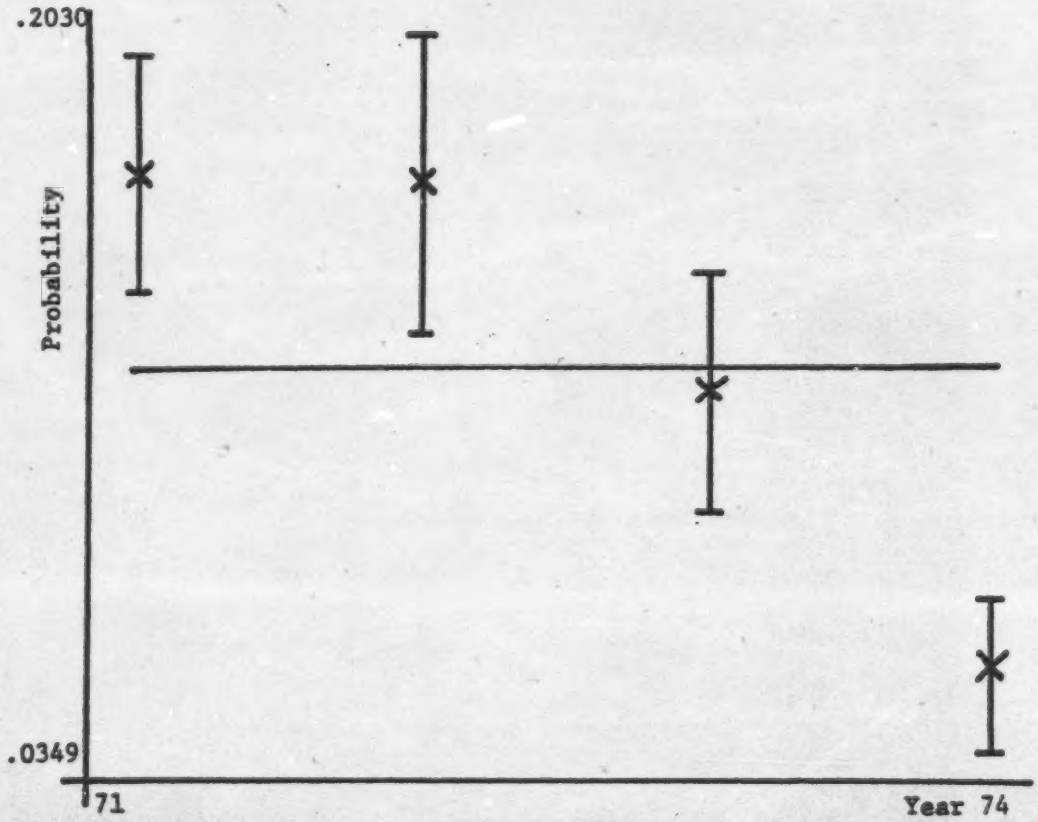


Figure 11 - YR1 to YR2 Combined Graph of PAP and Direct Placements

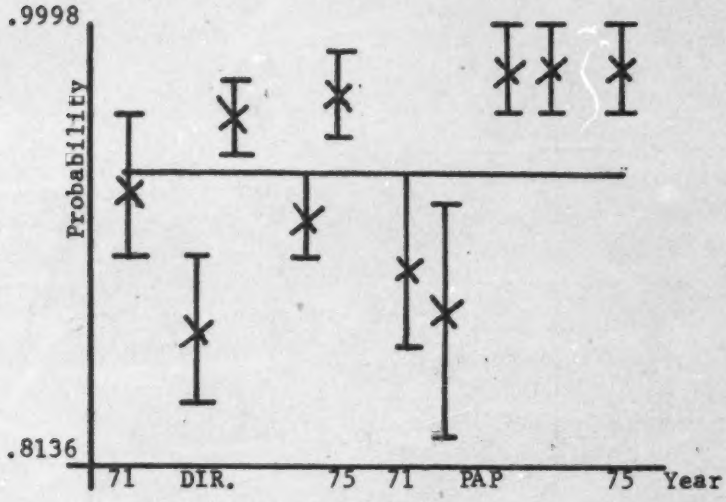


Figure 12 - YR2 to JMAN Combined Graph of PAP and Direct Placements

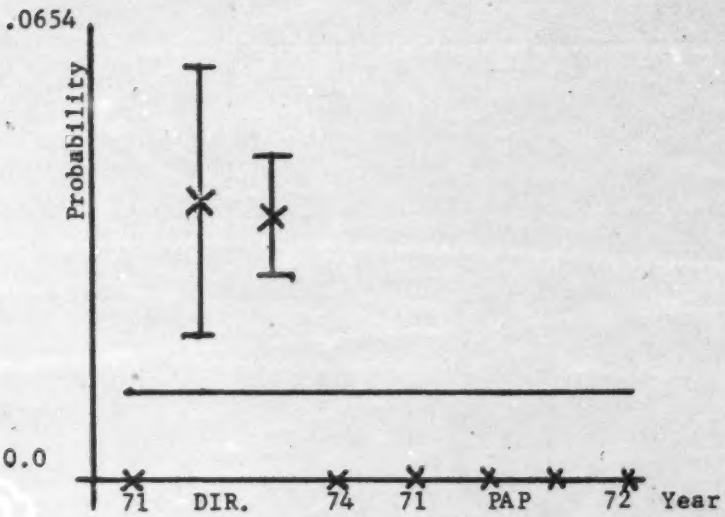
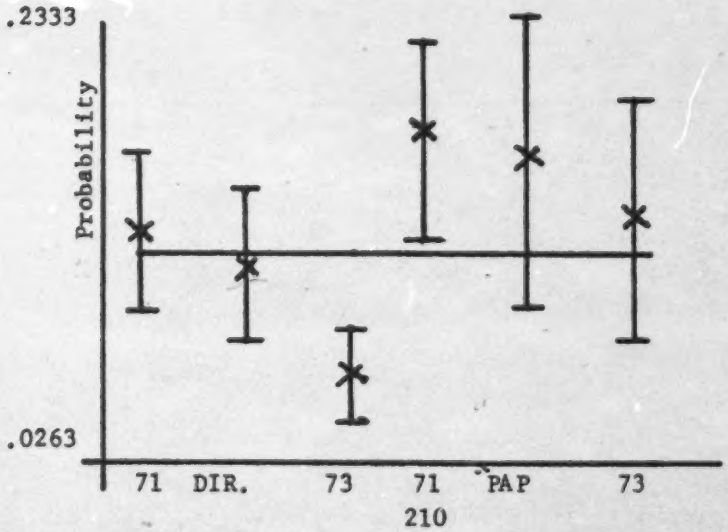


Figure 13 - YR 3 to TERM Combined Graph of PAP and Direct Placements



Clearly the population under investigation exhibits neither stationarity nor homogeneity. There is no doubt that further levels of non-homogeneity may exist, for example Apprentice and OJT trainees within each of PAP and direct placements. However, if one were to continue partitioning the data further, one would be left with too few observations on which to estimate the transition probabilities with any reasonable degree of accuracy. Since it was felt that the prime characteristic of interest was PAP vs direct placements, only this level of non-homogeneity has been admitted. The result was a set of four transition matrices for the four different populations PAP 1971-72; PAP 1973-75 Direct 1971-72; and Direct 1973-75. Within these groups both stationarity (reasonable) and homogeneity (slightly biased) were assumed. The bias introduced by the homogeneity assumption is as follows: for PAP placements the bias is virtually non-existant and for direct placements it is slightly negative i.e. the model would probably overpredict the number of failures. This is because there was a 6% difference in the 5-year cumulative probability of termination between Apprentice and OJT trainees who were placed directly, the representation of these two training types being 23% and 77% respectively. Thus our assumption of homogeneity for direct placements would underpredict failure in the Apprentice program and over predict failure in the OJT program. The corresponding values for the PAP placements are: a 9% difference between Apprentice and OJT trainees with 88% in the Apprentice program and 12% in the OJT program. Note that the probabilities used to compute the difference between apprentice and OJT trainees are, at best, crude with high standard deviations.

On the next few pages, the transition probability matrices and the 3,4, and 5 year cumulative probabilities of failure are presented for various clustering of the population.[1] A note of caution: in reading these figures it must be remembered that within the clustering under study, both stationarity and homogeneity have been assumed. The evidence presented above clearly indicates that either or both of these assumptions may well be invalid for the clustering in question.

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[1]The probability of moving from input state i to output state j in n periods is the ij th element of the n-step transitional probability matrix. In the case of a simple Markov Chain Model the n-step transition probability matrix is the 1-step probability matrix raised to the nth power. See Bhat, U.N. Elements of Applied Stochastic Processes, (1972) N.Y., J.Wiley

Table 5 - 5 Year Unions

0.000	0.950	0.000	0.000	0.000	0.000	0.050
0.000	0.000	0.926	0.000	0.000	0.000	0.074
0.000	0.000	0.000	0.907	0.000	0.013	0.080
0.000	0.000	0.000	0.000	0.868	0.075	0.057
0.000	0.000	0.000	0.000	0.516	0.484	0.000
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .191; 4-Year .236; 5-Year .236

Table 6 - 4 Year Unions

0.000	0.924	0.000	0.000	0.000	0.045	0.032
0.000	0.000	0.862	0.000	0.000	0.023	0.114
0.000	0.000	0.000	0.800	0.000	0.057	0.143
0.000	0.000	0.000	0.000	0.853	0.040	0.107
0.000	0.000	0.000	0.000	0.800	0.175	0.025
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .251; 4-Year .319; 5-Year .332

Table 7 - 3 Year Unions

0.000	0.927	0.000	0.000	0.000	0.009	0.064
0.000	0.000	0.787	0.000	0.000	0.000	0.213
0.000	0.000	0.000	0.812	0.000	0.094	0.094
0.000	0.000	0.000	0.000	0.745	0.191	0.064
0.000	0.000	0.000	0.000	0.765	0.176	0.059
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .331; 4-Year .368; 5-Year .394

Table 8 - PAP Placements 1971-72

0.000	0.868	0.000	0.000	0.000	0.000	0.117
0.000	0.000	0.786	0.000	0.000	0.000	0.214
0.000	0.000	0.000	0.818	0.000	0.013	0.169
0.000	0.000	0.000	0.000	0.810	0.063	0.127
0.000	0.000	0.000	0.000	0.719	0.188	0.094
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-YEAR .423; 4-YEAR .495; 5-YEAR 539

Table 9 - PAP Placements 1973-75

0.000	0.978	0.000	0.000	0.000	0.000	0.022
0.000	0.000	0.867	0.000	0.000	0.000	0.133
0.000	0.000	0.000	0.868	0.000	0.000	0.132
0.000	0.000	0.000	0.000	0.810	0.063	0.127
0.000	0.000	0.000	0.000	0.719	0.188	0.094
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .264; 4-Year .357; 5-Year .413

Table 10 - Direct Placements 1971-72

0.000	0.894	0.000	0.000	0.000	0.048	0.059
0.000	0.000	0.833	0.000	0.000	0.024	0.143
0.000	0.000	0.000	0.764	0.000	0.121	0.114
0.000	0.000	0.000	0.000	0.860	0.103	0.037
0.000	0.000	0.000	0.000	0.600	0.400	0.000
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .271; 4-Year .293; 5-Year .293

Table 11 - Direct Placements 1973-75

0.000	0.943	0.000	0.000	0.000	0.029	0.029
0.000	0.000	0.874	0.000	0.000	0.015	0.112
0.000	0.000	0.000	0.949	0.000	0.000	0.051
0.000	0.000	0.000	0.000	0.860	0.103	0.037
0.000	0.000	0.000	0.000	0.600	0.400	0.000
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .176; 4-Year .205; 5-Year .205

Table 12 - 1971 Cohort

0.000	0.911	0.000	0.000	0.000	0.006	0.083
0.000	0.000	0.832	0.000	0.000	0.000	0.168
0.000	0.000	0.000	0.840	0.[illegible]00	0.017	0.143
0.000	0.000	0.000	0.000	0.800	0.130	0.070
0.000	0.000	0.000	0.000	0.675	0.300	0.025
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Table 13 - Apprentice Trainees

0.000	0.931	0.000	0.000	0.000	0.003	0.066
0.000	0.000	0.843	0.000	0.000	0.000	0.157
0.000	0.000	0.000	0.934	0.000	0.007	0.060
0.000	0.000	0.000	0.000	0.937	0.053	0.011
0.000	0.000	0.000	0.000	0.854	0.146	0.000
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .259; 4-Year .266; 5-Year .266

Table 14 - OJT Trainees

0.000	0.924	0.000	0.000	0.000	0.043	0.033
0.000	0.000	0.854	0.000	0.000	0.022	0.125
0.000	0.000	0.000	0.827	0.000	0.094	0.079
0.000	0.000	0.000	0.000	0.819	0.133	0.048
0.000	0.000	0.000	0.000	0.545	0.432	0.023
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .210; 4-Year .242; 5-Year .254

Table 15 - Bidwell Placements

0.000	0.925	0.000	0.000	0.000	0.032	0.043
0.000	0.000	0.887	0.000	0.000	0.000	0.113
0.000	0.000	0.000	0.894	0.000	0.067	0.038
0.000	0.000	0.000	0.000	0.807	0.158	0.035
0.000	0.000	0.000	0.000	0.609	0.348	0.043
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Terminiation 3-Year .179; 4-Year .204; 5-Year .230

Table 16 - DIG Placements

0.000	0.929	0.000	0.000	0.000	0.018	0.052
0.000	0.000	0.850	0.000	0.000	0.026	0.124
0.000	0.000	0.000	0.787	0.000	0.031	0.181
0.000	0.000	0.000	0.000	0.850	0.033	0.117
0.000	0.000	0.000	0.000	0.667	0.333	0.000
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .310; 4-Year .383; 5-Year .383

Table 17 - OIC Placements

0.000	0.900	0.000	0.000	0.000	0.039	0.061
0.000	0.000	0.781	0.000	0.000	0.006	0.213
0.000	0.000	0.000	0.827	0.000	0.071	0.102
0.000	0.000	0.000	0.000	0.860	0.070	0.070
0.000	0.000	0.000	0.000	0.788	0.182	0.030
0.000	0.000	0.000	0.000	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	1.000

Cumulative Probability of Termination 3-Year .324; 4-Year .365; 5-Year .368

APPENDIX G

TRANSPORTATION MODEL

THE PRE-APPRENTICE PROGRAM MODEL

The core of the model is a transportation problem composed of two input classes (trainee types) and three employment programs (outputs). The two input classes assumed were: (1) class 1 --chronically unemployed and (2) class 2--underemployed (assumed unskilled/semi-silled). The three output employment types were: (1) skilled building trades unions; (2) non-construction; and (3) chronic unemployment. The transportation problem is shown in Figure 1.

Associated with each cell of the transportation problem is a transition probability, P_{ij}. Each P_{ij} represents the probability of an individual of input class i being placed in an employment type j. Of course, for each input class the transition probabilities sum to unity (i.e. $\Sigma_j P_{ij} = 1$). Also associated with each cell is a program cost, C_{ij}. Each C_{ij} represents the cost of recruiting, training, and placing an individual of input class i in employment type j. Finally, there is a benefit, B_{ij} associated with each cell. Each B_{ij} represents the present value of the projected increase in lifetime earnings stream for an individual of input class i being placed in employment type j.

MODEL

EMPLOYMENT TYPE

INPUT CLASS			
	B_{11} X_{11} (C_{11}) (P_{11})	B_{12} X_{12} (C_{12}) (P_{12})	B_{13} X_{13} $(C_{13}$ (P_{13})
	B_{21} X_{21} (C_{21}) (P_{21})	B_{22} X_{22} (C_{22}) (P_{22})	B_{23} X_{23} (C_{23}) (P_{23})
	D_1	D_2	D_3

The assumptions emplyed in the development of the model were:

(1) All allocated building trade union slots will be filled (i.e., the union slot constraint is an equality).

(2) All trainee will always be placed in the highest available employment type that he is qualified for.

(3) A trainee qualified for a higher employment type is qualified for all lower employment types.

(4) If an employment type is filled, qualified individuals will be placed in the next lower employment type.

(5) The training organizations whether due to recruiting, training, or placement activities increase the placement probabilities of a give input class.

(6) The higher input class will be more successful in the higher employment type (i.e., $P_{23} \geq P_{13}$).

(7) There is no limit on the number of slots of employment type 2.

(8) There is a constant program cost per trainee (i.e., no step functions, no economics of scale).

Given the transportation problem the slot considerations, and the budget constraint, the following relationships result:

(1) budget constraint, $\Sigma_i \Sigma_j C_{ij} X_{ij} \leq$ Budget

(a) $C_{11}X_{11} + C_{12}X_{12} + C_{21}X_{21} + C_{22}X_{22} + C_{23}X_{23} \leq$ Budget

(2) Transition probabilities for a given input class sum to unity,

$\Sigma_j P_{ij} = 1$

(a) $P_{11} + P_{12} + P_{13} = 1$

(b) $P_{21} + P_{22} + P_{23} = 1$

(3) Placement Constraints, $\sum_i X_{ij} = D_j$

(a) $X_{11} + X_{21} = D_1$

(b) $X_{12} + X_{22} = D_2$

(c) $X_{13} + X_{23} = D_3$

(4) Input Constraints, $\sum_i X_{ij} = S_i$

(a) $X_{11} + X_{12} + X_{13} = S_1$

(b) $X_{21} + X_{22} + X_{23} = S_2$

(5) Sufficient number of qualified candidates to fill the available union slots, $\sum_i P_{ij} S_i \geq D_j$ for each j J (J = union jobs)

(a) $P_{13} S_1 + P_{23} S_2 \leq D_3$

(6) Trainee placed in highest available employment type he is qualified for

(a) $(P_{12} + P_{13}) S_1 + (P_{22} + P_{23}) S_2 = D_2 + D_3$

(7) Inputs = Outputs, $\sum_i S_i = {}_jD_j$

(a) $S_1 + S_2 = D_1 + D_2 + D_3$

After removing redundant relationships and converting to appropriate form the following seven constraints were utilized:

Constraints:

(1) $(P_{12} + P_{13}) (S_1) = X_{12} + X_{13}$

(2) $(P_{22} + P_{23}) (S_2) = X_{22} + X_{23}$

(3) $C_{11}X_{11} + C_{12}X_{12} + C_{13}X_{13} + C_{21}X_{21} + C_{22}X_{22} + C_{23}X_{23}$ - Budget

(4) $X_{13} + X_{23} = D_3$ (slot constraint)

(5) $P_{13} (S_1) + P_{23} (S_2) = D_3$ (union placement)

(6) $P_{13} (S_1) \geq X_{13}$

(7) $P_{23} (S_2) \geq X_{23}$

The objective function for the model took the form:

$$\text{Maximize } \Sigma_i \Sigma_j B_{ij} X_{ij}$$

where B_{ij} = present value of the projected increase in lifetime earnings stream for an individual of input class i being placed in employment type j.

In order to model a different kind of an objective, that of cost minimization the above model needs only some minor modifications. Specifically the objective function becomes:

$$\text{Minimize } \sum_i \sum_j C_{ij} X_{ij}$$

All of the above constraints relating to transition probabilities remain the same in this model. Naturally the budget constraint is eliminated. The above formulation is based on the assumption that all unions slots have to be filled. However, yet another objective of such a program could simply be the

maximization of overall benefits given a budget constraint and an upper limit on the number of union slots available. In other words the equality constraint (4) above can be changed into an $\leq$, thus allowing the program to choose from that population which maximized total benefits. In testing the applicability of these model all three of the above formulations were used. The benefits and costs used are essentially the same as those used for the benefit cost analysés. The only difference is in the treatment of opportunity costs which were removed from the costs as calculated in Appendix D and subtracted from the benefits as calculated in Appendix E. The transition probabilities were calculated using results of the factor analysis (See Appendix D).

The values of the parameters used (see page 217) were:

$P_{11} = .1407$ $B_{11} = 79.4$ $C_{11} = 2.5$

$P_{12} = .1828$ $B_{12} = 56.6$ $C_{12} = 1.3$

$P_{13} = .6765$ $B_{13} = 0.0$ $C_{13} = 1.4$

$P_{21} = .2277$ $B_{21} = 59.0$ $C_{21} = 2.5$

$P_{22} = .1910$ $B_{22} = 36.9$ $C_{22} = 1.3$

$P_{23} = .5813$ $B_{23} = 0.0$ $C_{23} = 1.4$

UNION PLACEMENT MODEL

The transportation model developed for union placements is very similar to that developed for the pre-apprentice program. The only difference lies in the definition of the two input types. In this case the two input classes were: (1) the PAP placement; and, (2) the Direct placement. The definitions of the three output classes, the benefits, costs and transition probabilites remained the same. Note that in computing these parameters, the entire program was considered (as opposed to only the training component in the previous model).

Since the PAP model was developed in detail below, the details will not be repeated here. Once again, various kinds of models were used to explore a variety of policy situations. In general all models were run under the present conditions of a slot constraint (i.e., there is an upper limit to the Number of slots available to the Plan) and under a hypotesized journeymen

constraint with a limit only on the number of journeymen. Within each type the two types of models developed were: cost minimization and benefit maximization. As indicated in Appendices D, E, and F the parameter values used were (See page 217):

$P_{11} = .587$ $B_{11} = 148.689$ $C_{11} = 5.028$

$P_{12} = .165$ $B_{12} = 39.6$ $C_{12} = 5.028$

$P_{13} = .248$ $B_{13} = 10.247$ $C_{13} = 5.028$

$P_{21} = .795$ $B_{21} = 110.794$ $C_{21} = 1.785$

$P_{22} = .082$ $B_{22} = 11.536$ $C_{22} = 1.785$

$P_{23} = .123$ $B_{23} = 6.428$ $C_{23} = 1.785$

APPENDIX H

INDEX FOR DEFINITION OF UNEMPLOYED AND UNDEREMPLOYED POPULATIONS FOR THE PRE-APPRENTICE PROGRAM

All attempts at deriving a univariate definition of these two populations failed. Ultimately, using the results of the analysis of PAP trainees successful in being placed in a union training program five variables, critical in determining success at this level were identified. (see Chapter 4). These variables were age (AGE), military service status (MIL), highest grade completed (GRADE), occupation type - skilled general (L GENUN), and income earned in year prior to entering the PAP (LINC). For a detailed description of these variables see Appendix A.

This set of five variables was factor analyzed using the method of principal components.[1] The following table gives the percent of variance explained by each of the five factors extracted and eignvalues associated with each factor. Based on the eigenvalues the first two factors were selected and rotated using the varimax criterion.[2] The resulting matrix of loading is given in Table 2.

Since for our purposes a single factor (adequately describing the two types) was necessary, no further analyses were performed using the second factor. Using the first factor, factor scores were computed and the range of values broken down into equal intervals to permit calculations of success probabilities. A graph of the cumulative success probabilities is shown

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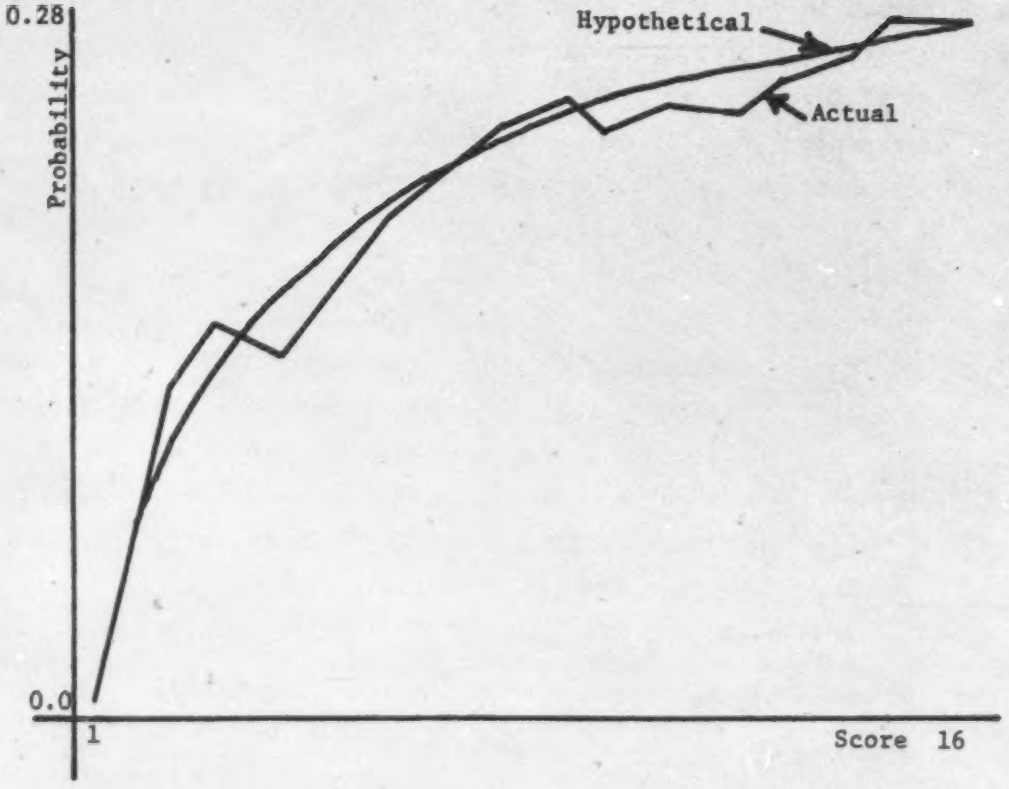
[1] Factor analysis is a generic name given a class of techniques whose purpose consists of data reduction and summarization. Factors of linear combinations of the variables in the data matrix were calculated with weights chosen to maximize the explained variance. This technique of data reduction is useful where, as with manpower studies, there is usually redundancy built into the data to check and increase the accuracy of the information. The factos were obtained by principal component analysis and then rotated were obtained by principal component analysis and then rotated by the varimax procedure to enhance the interpretation of the components or constructs. For introductor discussion of factor analysis and methods of rotation see Van de Greer (1970), Introduction to Multivariate Analysis for the Social Sciences (San Francisco: W. H. Freeman).

[2] See Harmon, Harry H., Modern Factor Analysis, 1969, University of Chicago, pp. 196-199.

Figure 1 Cumulative Success Probabilities



in Figure 1. Two things are obvious from this graph. The first is the smoothness of the empirical cumulative distribution function. The second is that there is no obvious point where a dramatic change could indicate a cut-off value required to identify the two types. In the absence of such information it was decided to divide the population around the mean of the factor scores, i.e., around the eighth point or interval.* The three transition probabilities were computed from the data and where necessary, normalized to the population transition probabilities. The following table contains the means (or the medians where applicable) for all six transition groups of the variables used in deriving the factor.

TABLE 1

	UNEMPLOYED			UNDER-EMPLOYED		
VARIABLE	UNION PLACE-MENTS	OTHER JOB PLACE-MENTS	UN-EMPLOYED	UNION PLACE-MENTS	OTHER JOB PLACE-MENTS	UN-EMPLOYED
AGE	22.75	22.36	22.1	26.34	26.26	
MIL	0.0	0.002	0.022	0.601	0.507	0.509
GRADE	11.819	11.43	11.47	11.96	11.91	11.56
LING	964.64	1135.0	511.346	3000	2950	2300
LGENSK	.011	.024	0.018	0.129	.227	.242
NUMBER OF OBSERVA-TIONS	105	91	259	118	66	134

TABLE 2

	COMMUNALITY	1	2
AGE1	1	0.61266	0.77934	0.07279
MIL2	2	0.52040	0.71767	-0.07314
GRADE9	3	0.74651	0.21749	-0.83618
LGENSK 15	4	0.46258	0.36783	0.57209
LINC 19	5	0.33242	0.57478	0.04528
SUM OF SQUARES OF COLUMNS:			1.63538	1.03919

* On a continuous scale the mean of the factor scores (0.0) falls into this interval.

APPENDIX I

MIS USER MANUAL AND SAMPLE OUTPUT

Introduction

The purpose of this manual is to assist users in the operating of the Management Information System (MIS). This system is designed to be used as a management tool by the Pittsburgh Plan pre-apprentice training organizations (BIDWELL, DIG, OIC) in the updating and retrieval of information and statistics on their placements in the union training programs.

The following are the statistics and information that may be listed on a teletype or computer printer at the touch of a button.

- A listing of all personal data on all union placements in the Pittsburgh Plan. This list may be dissagregated for each specific training organization's (BIDWELL, DIG, OIC) placements.*
- A listing of all individuals' follow-up data for a specific month.**
- A listing by one or more contractors which include the I.D. number of individuals in the Plan that worked for them during any particular month. This listing includes the individual's classification,

*The personal data printout includes an individual's I.D. number, name, address, phone, date of birth, placement date, trade, counselor, and organization.

**The follow-up data prinout includes an individual I.D. number, name, classification trade, employment status, hourly pay, job site, day of counselor contact and organization.

employment status, contractor, and organization.

- A listing by counselor which includes I.D. numbers of all individuals contacted by them for any month specified. This listing includes data on placements contacted such as classification, employment status, organization, site contacted at, contractor, day of contact, and hourly wage.

Using the MIS

Overview:

The next sections describe how to use the MIS. There are six basic operations available to the user:

1. Retrieve - This command allows the user to obtain a specific individual's personal and follow-up data.
2. Delete - This command erases an individual's personal and follow-up data.
3. Insert - This command allows the user to insert new personal data on an individual entering the Plan.
4. Update - This command allows the user to insert new follow-up data on an individual already in the system.
5. Listings - This command allows the user to list all of the statistics and information described in the introduction.

6. Edit - This command allows the user to change existing personal data on follow-up data for each individual in the Plan.

Once Logged On:

Every statement printed by the computer is underlined and every users' response is underlined twice. The computer lists the six basic operations:

YOU MAY PERFORM ANY OF THE FOLLOWING OPERATIONS

RETRIEVE

DELETE

INSERT

UPDATE

LISTINGS

EDIT

INPUT OPERATION DESIRED-RETRIEVE* (c.r. - carriage return)

The computer has just asked the user which of the six basic operations he wishes to perform, theuser typed in the command RETRIEVE, let us examine what happens next.

I.D. NO. FORMAT NNNNN-02009 (c.r.)

This prompts the user to insert an individual's I.D. number. The number must be five digits long with significant digits right

*Basic acquaintance with the use of a teletype is assumed.

justified, i.e., if the user had input 2009 instead of 02009, the computer would have looked at that as 20090.

The computer prints out:

2009 CROSBY, JACK P.O. BOX 574 15293 361-3662

DATE OF BIRTH 5-11-47 PLACEMENT DATE 7-16-71 CLAS. APP

TRADE CARPENTER COUNCILLOR FLENORY, JOSEPH ORG OIC

FOR FOLLOW UP DATA INPUT ALL, NO, OR HIT RETURN FOR SPECIFIC DATE (c.r.)

The computer has just asked if the user wishes follow-up data on the individual he retrieved personal data on and if so, whether he wanted all or only for a specific data.

Since the user hits c.r., the next required is:

YEAR? - 1970

MONTH? - JAN

Using this, the computer prints out

FOLLOW-UP DATA FOR JAN 1970

DAY OF CONTACT 3 STATUS EMP PAY 6.52

CONTRACTOR PENN ERECTION SITE CIVIC ARENA

If there had been no data for this date, the computer would have printed out:

NO DATA FOR SPECIFIED DATE

ANY MORE DATES? YES/NO

to which the user may reply as desired.

If, on the other hand, the user had typed in ALL, the computer would have typed out all the available follow-up data. Or if he had typed in NO, the computer would finish up this individual and print.

NEXT I.D. NO. TO STOP HIT RETURN (c.r.)

If the user had any more I.D. numbers to retrieve he would have input the five digit I.D. number, but since he did not, he hit the carriage return.

RETRIEVAL FINISHED

NEXT OPERATION? TO STOP HIT RETURN (c.r.)

The computer prints out that the retrieval operation is finished and would then like to know if there are any further operations that the user desires. The user did not so he hit the carriage return which disconnects him from the machines until the next time he wishes to logon. If the user had wished to perform another operation, he would have typed in that operation before hitting carriage return.

Now that the user has a general explanation of one operation, the manual will take a look at the more ambiquous commands in each of the other functions. The beginning is always the same. The computer asks for the desired operation and then proceeds to carry out that operation. Therefore, from here on, it is assumed that the desired operation has been specified. The operation specified is delineated in a [ ].

DELETE

I.D. NO? 02009

The user is in the delete function and the computer has just asked for a five digit (right justified) I.D. number that is to be deleted. The user typed in 02009. The computer then prints out:

2009CROSBY, JACK P.O. BOX 574 15208 3613662

DELETE? YES/NO-YES

The computer prints out the person's name, address and phone number and then asks if this is the information to be deleted. This is done merely as a safety device. The user types in the response YES, and all the information on the individual is deleted. If the user had typed in the response NO, then nothing would have changed--the information would not be deleted.

INSERT NEW DATA

I.D. NO.? FORMAT (NNNNN);TO STOP HIT RETURN - 11342

The user is now in the insert new data routine and the computer has just asked for a five digit I.D. number to be inserted. The computer next prints:

INPUT NAME; ADDRESS; PHONE NUMBER; FORMAT:-

NNNNNNNNNNNNNNNNNNNN NNNNNNNNNNNNNNNNNNNNNNNN NNNNNNN
1 2 3

The N's are typed out to help in the proper aligning of the information being typed in. In the area worked as:

1. Type in the name of the individual to be inserted under the first string of N's.
2. Type in the individual's street number and street name under the second string of N's.
3. Type in the individual's phone number under the third strong of N's.

The other commands in this routine are repetitions of previous commands except for those discussed in the Update follow-up data routine section.

UPDATE FOLLOW UP DATA

The first question the computer will ask is:

IS DATA CODED? YES/NO - NO

The user may insert data two ways coded and uncoded. This is the format for data which is not coded:

INPUT I.D. NO.; DAY OF CONTACT; JOB SITE; PAY; CONTRACTOR; STATUS (EMP=1, UNEM=2); FORMAT

```
NNNNN NN NNNNNNNNNNNNNNNNNNNN NN.NN NNNNNNNNNNNNNNNNNNNN N
  1   2          3              4          5                6
```

INPUT DATA LINE BY LINE. TO STOP HIT RETURN

1. Insert I.D. number
2. Insert councellor's day of contact
3. Insert job site
4. Insert hourly wage
5. Insert contractor s name
6. Insert 1 if the individual is employed, 2 if he is not employed.

The user may do this for as many individuals as he wants, a carriage return is hit after each line, and a carriage return is hit without any data being typed in when the input is finished. What happens if the data is coded? Everything is the same except for the format in which the data is entered into the machine. It looks like this:

```
NNNNN NN NNN NN.NN NNN N
  1   2  3   4    5  6
```

where:

1. Column 1-5, 2. Column 6-7, 3. Column 9-11, 4. Column 12-16, 5. Column 17-19, 6. Column 21, 7. Column 23-26, 8. Column 27-29

AGGREGATE DATA LISTINGS

This routine allows the user to retrieve statistics described in the introduction. The first message in this routine is:

THE FOLLOWING PRINTOUTS ARE AVAILABLE-

1 TRAINEE LISTING

2 PLAN LISTING

3 UNION LISTING

4 CONTRACTOR LISTING

5 COUNSELOR LISTING

INPUT INDEX NUMBER OF LISTING DESIRED. IF ALL ARE DESIRED INPUT 6 -

If the user inputs 1,there will be a computer printout of all people in the plan broken down by organization. This listing includes all personal data on individuals. If 2 is typed in, there will be a computer printout of all people in the plan who had follow up data for a specified month. If 3,4, or 5 is typed in, there will be a teletype printout or a data set created by union, contractor, or counselor respectively. The following is a sample listing of the input received on the teletype if a 3 is inputed.

INPUT INDEX NUMBER OF LISTING DESIRED. IF ALL ARE DESIRED INPUT 6 - 3

YEAR?-1970

MONTH?-JAN

The numbers 1,2,4, and 6 are asking for the same thing as in the uncoded section. Numbers 3 and 6 are asking for a three digit number which corresponds to the individual's job site and contractor. A listing of such numbers will be available to each organization. Another question in this routine is:

IF FOLLOW UP DATA IS IN A DATA SET INPUT FILE NUMBER; IF NOT INPUT 05 (FORMAT NN)-

If the user has decided to input their data from data cards, you will input the number we give you, if you are inputing it at a teletype you would input 05. This is the format your punched cards must be in:

```
NNNNN NN NNNNNNNNNNNNNNNNNNNN NN.NN NNNNNNNNNNNNNNNNNNNN N NNNN  NNN
  1   2            3             4             5          6  7    8
```

Where:

1. Column 1-5. I.D. number five digits right justified
2. Column 7-8 Day of counselor contact
3. Column 9-28. Job site
4. Column 29-33. Hourly wage, this too is right justified

   example: NN.NN
            4.67

5. Column 34-53. Contractor
6. Column 54. Status 1=employed, 2=unemployed
7. Column 55-58. The year of the follow up data
8. Column 60-62. The month of the follow up data

If data is coded, the same eight digits apply with numbers #3 and #5 only using three spaces.

```
NNNNN NN NNN NN.NN NNN N NNNN NNN
  1   2  3    4    5  6  7    8
```

IF DATA IS REQUIRED FOR ALL UNIONS INPUT ALL; IF NOT HIT RETURN- (c.r.)

INPUT UNION; TO STOP RETURN-PAINTER

INFORMATION BY TRADE FOR JAN 1970

TRADE PAINTER

ID NO	CLAS.	STATUS	CONTRACTOR	ORG
	APP	UNEM	SCHNEIDER INC.	DIG
11136	OJT	EMP	LIMBACH CO.	DIG
1137	OJT	EMP	ALL STATE	OIC

TOTAL OJT = 2

TOTAL APP = 1

TOTAL = 3

BID = Ø DIG = 2 OIC = 1

EDIT

If this is the operation the user wishes to use, this is the first question he must answer:

TO EDIT PERSONAL DATA INPUT PERSONAL: IF NOT RETURN - PERSONAL

The user typed in PERSONAL because he wishes to edit personal data; he would hit return if he wanted to edit an individual's follow-up data. Next the computer would print out this box of information:

I.D. NO.? (FORMAT NNNNN); TO STOP HIT RETURN-1ØØØØ

Ø1 I.D. NO. (FORMAT NNNNN)

Ø2 NAME (2Ø SPACES)

Ø3 ADDRESS (25 SPACES)

Ø4 PHONE NO. (FORMAT NNN-NNNN)

Ø5 DATE OF BIRTH (FORMAT NN-NN-NN)

Ø6 PLACEMENT DATE (FORMAT NN-NN-NN)

Ø7 CLASSIFICATION (OJT/APP)

Ø8 TRADE (1Ø SPACES)

Ø9 COUNCILLOR (2Ø SPACES)

10 ORGANIZATION (OIC, BID, DIG)

Other commands:

There are a few more messages which the user may receive throughout the program which need to be mentioned:

1. YEAR?-This command is asking you for which year you are interested in using
2. MONTH?-This is asking you which month you are interested in
3. XXXXXXXXXX - NON EXISTENT: TO ADD IT TO THE LIST OF XXXXXXXXXX INPUT INSERT OR A CORRECTED NAME -

Where XXXXXXXXXX stands for counselor, trade, site or contractor. If the name the user typed in is new and he wished to add it to the list of XXXXXXXXXX then type in INSERT, if,however, the user mispelled the name, he would input the corrected spelling of that name.

Due to the requirements of the program, the size of any data file is If the user wishes to add data into a file already full, then the following message is printed.

4. MATRIX FULL CHANGE DIMENSION STATEMENT

In this case please call the systems programmer.

It is suggested that this system cannot be learned by this manual alone and that a few hours of instruction is necessary.

SAMPLE RUN ON A REMOTE TERMINAL

```
YOU MAY PERFORM ANY OF THE FOLLOWING OPERATIONS
RETRIEVE
DELETE
INSERT NEW DATA
UPDATE FOLLOW UP DATA
LISTINGS
EDIT
INPUT OPERATION DESIRED-RETRIEVE
 I. D. NO.? FORMAT NNNNN-02527

 2527   ALSTON, JERRY          1967 SAN JUAN ST.  15235    362-6281

DATE OF BIRTH  1-19-46 PLACEMENT DATE  8- 9-73 CLAS. OJT

TRADE OP.ENGINEE   COUNSELOR BLACKWELL, BLAIR       ORG BID

FOR FOLLOW-UP DATA INPUT ALL, NO OR HIT RETURN FOR SPECIFIC DATA-ALL
FOLLOW-UP DATA FOR JAN 1970

DAY OF CONTACT   7  STATUS EMP   PAY  6.39

CONTRACTOR SOFIS                SITE BEAVER FALLS, PA.
NEXT I.D.NO. TO STOP RETURN.-
RETREIVAL FINISHED
NEXT OPERATION?; TO STOP HIT RETURN-EDIT
TO EDIT PERSONAL DATA INPUT PERSONAL;IF NOT RETURN-PERSONAL
I.D. NO.?(FORMAT NNNNN); TO STOP HIT RETURN-02527
01 I.D. NO. ' (FORMAT NNNNN)
02 NAME (20 SPACES)
03 ADDRESS (25 SPACES)
04 PHONE NO. (FORMAT NNN-NNNN)
05 DATE OF BIRTH (FORMAT NN-NN-NN)
06 PLACEMENT DATE (FORMAT NN-NN-NN)
07 CLASSIFICATION (OJT/APP)
08 TRADE (10 SPACES)
09 COUNSELOR (20 SPACES)
10 ORGANIZATION (OIC, BID, DIG)
NPUT APPROPRIATE INDEX NUMBER; TO STOP HIT RETURN-10
EXISTING VALUE IS
BID
INPUT NEW DATA
DIG
INDEX NO?; IF NO MORE CHANGES HIT RETURN-10
EXISTING VALUE IS
DIG
INPUT NEW DATA
BU\ID
INDEX NO?; IF NO MORE CHANGES HIT RETURN-
I.D. NO.?(FORMAT NNNNN); TO STOP HIT RETURN-
EDITING FINISHED
```

```
NEXT OPERATION?; TO STOP HIT RETURN-LISTINGS
THE FOLLOWING PRINTOUTS ARE AVAILABLE-
1  TRAINEE LISTING
2  PLAN LISTING
3  UNION LISTING
4  CONTRACTOR LISTING
5  COUNSELOR LISTING
INPUT INDEX NUMBER OF LISTING DESIRED. IF ALL ARE DESIRED INPUT 6 -6
YEAR?-1970
MONTH?-JAN
ALL ORGANIZATIONS INPUT ALL; BID, DIG, OIC, INPUT ORG NAME /ALL

IF DATA IS REQUIRED FOR ALL UNIONS INPUT ALL; IF NOT HIT RETURN-

INPUT  UNION; TO STOP  RETURN-OP.ENGINEER

INFORMATION BY TRADE FOR JAN 1970

TRADE  OP.ENGINEE

ID NO   CLAS.   STATUS   CONTRACTOR          ORG

 2527   OJT     EMP      SOFIS               BID

 5135   OJT     EMP      LAMPL CONTR.        OIC

11162   OJT     UNEM     TED WALSH           DIG


TOTAL OJT       =   3

TOTAL APP       =   0

                ----

TOTAL           =   3

BID =  1 DIG =  1 OIC =  1

INPUT -UNION; TO STOP  RETURN-
IF DATA IS REQUIRED FOR ALL COTRACTORS INPUT ALL; IF NOT HIT RETURN -

INPUT CONTRACTORS NAME; TO STOP HIT RETURNTED WALSH

INFORMATION BY CONTRACTOR FOR JAN 1970

CONTRACTOR - TED WALSH
```

```
ID NO    CLAS.    STATUS    TRADE         ORG

11162    OJT      UNEM      OP.ENGINEE    DIG


TOTAL OJT          =     1

TOTAL APP          =     0
                         -----

TOTAL              =     1

BID =    0 DIG =    1 OIC =    0
INPUT CONTRACTORS NAME; TO STOP HIT RETURN
IF DATA IS REQUIRED FOR ALL COUNCELLORS INPUT ALL; IF NOT HIT RETURN -
INPUT DESIRED COUNCELLOR; TO STOP HIT RETURN -BLACKWELL, BLAA\IR


INFORMATION BY COUNCELLOR FOR JAN 1970

COUNCELLOR  BLACKWELL, BLAIR


ID NO CLA STA ORG SITE                      CONTRACTOR          DAY PAY

 2527 OJT EMP BID BEAVER FALLS, PA.         SOFIS                 7  6.39

 5001 OJT EMP BID 31ST ST. BRIDGETS         CITY OF PGH.          6  5.00

 5135 OJT EMP OIC DIVINE PROV. HOSPI.       LAMPL CONTR.         17  6.36

 5354 OJT EMP DIG CARNEGIE-MELL UNIV.       BURRELL CO.          14  6.03

 8265 OJT UNE DIG BRIDGEVILLE HIGHWAY       MELLON STEWART        9  5.50

11049 APP EMP DIG E. MCKSPRT -RT. 30        JONES & KRALL        13  7.00

11162 OJT UNE DIG BLAWNOX COUNTY  PA.       TED WALSH             8  4.79
INPUT DESIRED COUNCELLOR; TO STOP HIT RETURN -
ANY OTHER LISTINGS, INPUT INDEX NUMBER, IF NOT HIT RETURN-6
YEAR?-1970
MONTH?-JAN
ALL ORGANIZATIONS INPUT ALL; BID, DIG, OIC, INPUT ORG NAME /ALL


TOTAL NUMBER OF PLACEMENTS    30  BID =    4 DIG =   24 OIC =    2
IF DATA IS REQUIRED FOR ALL UNIONS INPUT ALL; IF NOT HIT RETURN-ALL
IF DATA IS REQUIRED FOR ALL COTRACTORS INPUT ALL; IF NOT HIT RETURN -ALL
IF DATA IS REQUIRED FOR ALL COUNCELLORS INPUT ALL; IF NOT HIT RETURN -AL
ANY OTHER LISTINGS, INPUT INDEX NUMBER, IF NOT HIT RETURN-
NEXT OPERATION?; TO STOP HIT RETURN-
 TERMINATED: STOP
```

APPENDIX J

SENSITIVITY ANALYSIS OF BENEFIT-COST RATIOS FOR COMPARISON OF PAP AND DIRECT PLACEMENTS

The focus of this discussion is the inferior placement performance of the training program for PAP placements; therefore, the weighted sum of benefit-cost ratios for the direct placement program is held constant throughout at the value presented, 50.4. The weighted sum of benefit-cost ratios is simply a method of calculating an overall benefit-cost ratio for a program with multiple output states which participants may occupy, depending on the proportion which occupy each state, i.e., $\sum_i (\text{benefits}_i \text{ times proportion}_i)/\text{cost}_i$ for each output state i. Four scenarios[1] are presented to test the sensitivity of the results to possible improvements in PAP trainee success and to errors in assumptions.

Throughout the analysis the PAP cost per union placement is assumed to remain constant at $2,507. See Appendix D (Cost Development for the Transportation Model, Four Output Scenario - PAP) for this cost estimate. See Appendix E and Benefit-Cost Analysis for details of the benefits derivations. See Failure Analysis for a discussion of union termination rates. The termination rates used throughout the analysis are the five-year estimates based on 1973-1975 data.

Scenario One

Weighted sum of benefit-cost ratios for direct placements = 50.4

Assumption: Increase the placement success rate of PAP enrollees from 17.6% to 100%

Consequence: Weighted sum of benefit-cost ratios for PAP placements is 38.5

Scenario Two

Weighted sum of benefit-cost ratios for direct placements = 50.4

Assumption: Decrease the five-year rate of termination from union training for PAP placements from 41.3% to 0.0%

Consequence: Weighted sum of benefit-cost ratios for PAP placements is 18.2

Scenario Three

Weighted sum of benefit-cost ratios for direct placements = 50.4

Assumptions: (1) Increase the placement success rate of PAP enrollees from 17.6% to 100%

(2) Decrease the five-year rate of termination from union training for PAP placements from 41.3% to that for direct placements, 20.5%

Consequences: Weighted sum of benefit-cost ratios for PAP placements is 48.6

Scenario Four

Weighted sum of benefit-cost ratios for direct placements = 50.4

Assumptions: (1) Increase the placement success rate of PAP enrollees from 17.6% to 100%

(2) Decrease the five-year rate of termination from union training for PAP placements from 41.3% to 0.0%

Consequence: Weighted sum of benefit-cost ratios for PAP placements is 59.4

The only scenario for which the PAP training program exhibits a greater weighted sum of benefit-cost ratios than the direct program is Scenario Four. Both assumptions in this scenario are outrageous, especially since the costs were not increased. The placement success rates for PAP's at the three training organizations for 1971-1975 were 9%, 18% and 25%. (See Chapter 4 for more information .) To increase the rate to 100% means not only that every trainee completing PAP training must be placed but also that every trainee must complete PAP training. The rates of completion of PAP training for 1971-1975 at the three organizations were 62%, 68% and 56%. (See Chapter 4.)
To effect even half the improvement from the 17.6% placement rate to 100% would be quite unexpected. Of course the assumption of 11 PAP placements becoming journeymen is also unreasonable. Placements from any source will experience some level of attrition in the 3-5 year training period required.

GLOSSARY OF TERMS*

AIC	Apprentice Information Center, Bureau of Employment Security, Pennsylvania.
APP	entered union training program as an apprentice
Bidwell	Bidwell Cultural and Training Center - one of the three training organizations
Dig	Operation Dig - one of the three training organizations
Direct Placement	individual placed in union training program without having been in the pre-apprentice program
Follow-up	contact by Pittsburgh Plan staff with individuals placed in union training programs
Failure	termination from union training program prior to reaching journeyman status
JAC	Joint Apprentice Committee - generally each union has one such Committee
OIC	Opportunities Industrialization Center - one of the three training organizations
OJT	entered union training in the On-the-Job training program
On-Board	individual has not been terminated from the union training program
PAP	Pre-Apprentice training program
PAP Placement	individual placed in a union training program following participation in the pre-apprentice program
Placement	acceptance of individual by union for entry into its training program
Quit	treated as a termination
Terminate	termination from union training program prior to reaching journeyman status
Training Organization	pre-apprentice training organization.

*The terms listed are used freely throughout the report. Familiarization with their meanings will aid in following the flow of the discussion.

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